The role of affective urgency and emotion regulation in vaping susceptibility

Jason Reff, Joseph S. Baschnagel [*]

Rochester Institute of Technology, Department of Psychology, Health and Addictions Research Center

A R T I C L E   I N F O

A B S T R A C T

Introduction: The prevalence of E-cigarette use is increasing along with concerns about the negative health effects of their use. Understanding the psychological constructs associated with susceptibility to beginning regular e-cigarette use may be helpful for prevention efforts. Factors such as emotion regulation (ER) and impulsivity, specifically urgency, have been significantly correlated with patterns of drug addiction in the past. With few prior studies linking ER and impulsivity factors with e-cigarette susceptibility, the present study aims to assess their relationship in predicting e-cigarette susceptibility in university never-smokers.
Method: Two hundred and twenty-five students were surveyed online using a questionnaire measuring difficulties in ER, impulsivity, and e-cigarette susceptibility. Path analysis was used to understand the relationship between positive and negative urgency and ER in predicting susceptibility to use.
Results: Results indicated that negative urgency was mediated by difficulties in ER to predict susceptibility while positive urgency was not significantly related to susceptibility.
Conclusion: The results of this study offer insights into the role affective traits contribute to susceptibility to e-cigarettes, potentially improving future addiction prevention research.

1. Introduction

E-cigarette, or vaping, products have been rising steadily in popularity for the past decade (Fadus, Smith, & Squeglia, 2019). While e-cigarettes are primarily used as an alternative to traditional cigarettes (Coleman et al., 2017), adolescents are particularly susceptible to their appeal. High schoolers have been shown to be more likely to use e-cigarettes than any other form of tobacco in recent years, with 20.8% of US high school students reporting current use of e-cigarettes (Gentzke et al., 2019). Prevalence of frequent e-cigarette use has also increased significantly from 2017 to 2018, up from 20.0% to 27.7% among high school e-cigarette users in the United States (Gentzke et al., 2019). The last Surgeon General report on E-cigarette use reported that in young adults aged 18–24 years approximately 35.8% have indicated ever using e-cigarettes and 13.6% have reported current use (Services USDoHaH, 2016).

While e-cigarettes are widely believed to be less dangerous than traditional cigarettes (Coleman et al., 2017; Sutfin et al., 2013), there is a growing pool of evidence suggesting potential health risks associated with vaping. The CDC has reported over 2,800 hospitalizations and 68 deaths due to EVALI (e-cigarette, or vaping, product use-associated lung injury) as of February 2020 (Werner et al., 2020). E-cigarette liquids and the by-products of its aerosolization can contain many chemicals; including formaldehyde, acrolein, and various heavy metals (see (Services USDoHaH, 2016), for review). Furthermore, e-cigarettes contain nicotine, an addictive substance, which is associated with its own adverse health effects such as acute toxicity, adverse effects on fetal development, and potential neurodevelopmental consequences in adolescents (Services USDoHaH, 2016).

Given the health risks associated with e-cigarette use, the risk factors associated with initiation are of interest to those interested in prevention. There is prior research on factors associated with initiation of traditional cigarette smoking with factors being categorized as either proximal or distal influences, as explained under the Theory of Triadic Influence model (Flay, 1999). Interpersonal, intrapersonal, and socio-cultural factors (distal influences) can impact an individual's willingness to smoke just as cognitive and affective factors (proximal influences) can play a role. For example, Leatherdale and colleagues (Leatherdale, McDonald, Cameron, Jolin, & Brown, 2006) found that social factors, such as the smoking rate of upperclassmen in the school which one

---

* Corresponding author at: Department of Psychology, Rochester Institute of Technology, 1 Lomb Memorial Dr., Rochester, NY 14623, USA.
E-mail address: jsbgsh@rit.edu (J.S. Baschnagel).

attends, highly predict smoking susceptibility in never-smoker adolescents. It was also found that the current smoking status of the mother was a significant predictor for susceptibility in that same population (Leatherdale et al., 2006). Proximal influences, such as one's expectation to smoke in the future, have also been shown to predict for future smoking behaviors (Choi, Gilpin, Farkas, & Pierce, 2001).

Future susceptibility to cigarettes, both traditional and electronic, has been defined as any future intent to smoke in the next year, as well as any likelihood of trying cigarettes if offered them by a close friend. These intentions are measured using the Teenage Attitudes and Practices Survey (TAPS II) questionnaire, with "susceptible" being defined as anything other than answering "definitely not" to the following questions: "Do you think you will try a cigarette soon?", "If one of your best friends were to offer you a cigarette, would you smoke it?", and "Do you think you will be smoking cigarettes 1 year from now?" (Choi et al., 2001; Pierce et al., 1996). This method of measuring susceptibility was further validated to be correlated with future cigarette use, as measured by follow-up surveys (Choi et al., 2001). Compared to cigarette susceptibility, e-cigarette susceptibility appears to have similar validity as a predictor for future initiation of e-cigarette use as well as current use upon 6-month follow-up (Bold, Kong, Cavallo, Camenga, & Krishnan-Sarin, 2018).

One proximal intrapersonal factor linked to drug use is emotion regulation (ER). Emotion regulation is the process by which an individual tries to influence their emotional experience and expression (Gross, 2002) such as by changing one's situation, attention, appraisal, response, or any combination of the four (Gross, 2015). ER also encompasses the feedback system responsible for maintaining, switching, and/or stopping implemented ER strategies. These emotion regulation strategies may involve affect upregulation, maintenance, or attenuation (Morris and Reilly, 1987; Gratz and Roemer, 2004; Thompson et al., 2008). Difficulties in regulating emotions has been linked to various negative health outcomes, including addiction (Estévez et al., 2017; Coifman and Summers, 2019) and has been identified as a core transdiagnostic risk factor in the development of substance use in adolescents (Shadur & Lejuez, 2015).

Emotion regulation and affect control have been previously correlated with aspects of addiction and substance use disorders, specifically reinforcement. A meta-analysis by Cheetham, Allen, Yücel, and Lubman (2010) supports the theory that affect dysregulation plays a significant role in addiction with negative affect linked to both development and maintenance of substance use disorders and positive affect correlating with reinforcement (Cheetham et al., 2010; Berking et al., 2011). Emotional intelligence, a construct that shares similarities with ER and has been compared in the past (Peña-Sarrionandia, Mikolajczak, & Gross, 2015), has been shown to interact with risk factors to impact future intent to smoke cigarettes in adolescents (Trinidad, Unger, Chou, Azen, & Johnson, 2004). These risk factors include hostility, previous cigarette use, and perceived ability to refuse cigarettes. Hill and Maggi (Hill & Maggi, 2011) later supported these results in finding that lower emotional intelligence scores were correlated with a greater risk of daily cigarette smoking. This study also found that high stress management scores (a subscore of emotional intelligence) were specifically correlated with a lower frequency of smoking behaviors. Emotion regulation has also been tied to smoking cravings in current cigarette users, with emotional reappraisal appearing to be more effective in subduing cravings compared to acceptance or suppression techniques (Szasz, Szentagotai, & Hofmann, 2012). Overall, previous results suggest that an individual's stress response and negative affect control may be important risk factors for initiation of smoking.

Another trait linked to both drug use and emotion regulation is impulsivity which commonly is broken down into five sub-traits: lack of perseverance, lack of premeditation, sensation-seeking, and positive and negative urgency (Whiteside and Lynam, 2001; Cyders and Smith, 2008; Schreiber et al., 2012). While many of these sub-scales have been linked to drug use in general and tobacco use more specifically (Lydon-Staley

and Geier, 2018; Doran et al., 2009; Doran and Tully, 2018; Lee et al., 2015; Torres et al., 2013) the two that most directly relate to the role of emotion in drug use are positive and negative urgency. Urgency is a sub-trait of impulsivity characterized by engagement in rash behavior caused by changes in affect (Whiteside & Lynam, 2001). Positive urgency is related to impulsivity generated during states of high positive affect, while negative urgency is related to impulsivity related to states of high negative affect (Cyders & Smith, 2008). Urgency has been correlated with maladaptive behaviors such as drinking alcohol for the purpose of coping (Anestis, Selby, & Joiner, 2007). Negative urgency in particular has been shown to be associated with problematic levels of alcohol consumption (Fischer, Smith, Annus, & Hendricks, 2007). With respect to cigarette smoking, negative urgency has been shown to be a predictor for smoking compared to non-smokers, as well as daily smoking compared to non-daily smokers (Lee, Peters, Adams, Milich, & Lynam, 2015). Negative urgency has also been shown to mediate the effects of depressive symptoms in adolescents to increase risk for lifetime substance use, including the use of cigarettes (Pang, Farrahi, Glazier, Sussman, & Leventhal, 2014). Previous findings suggest that positive urgency, alongside negative urgency, sensation seeking, and negative affect, may be a significant covariate of cigarette susceptibility in tobacco naive middle school students (Lechner et al., 2018).

Previous research has linked emotion regulation and the factors of impulsivity of negative and positive urgency with smoking behavior. For example, Dir and colleagues (Dir, Banks, Zapolski, McIntyre, & Hulvershorn, 2016) found that positive beliefs about the consequences of smoking were significantly correlated with higher negative urgency and higher emotion dysregulation. Less is known about how these factors work together to influence the risk of initiating e-cigarette use in people who are never-smokers. While research directly linking emotion regulation and impulsivity is limited, one study measuring young adults who gamble found that higher levels of emotional dysregulation were significantly correlated with higher levels of impulsivity, measured through self-report and impulsivity questionnaires (Schreiber, Grant, & Odlaug, 2012). The relationship between positive and negative urgency and drug use may be influenced by one's ability to regulate their emotions when in situations that trigger intense emotions. The current study aims to assess the relationship between both positive and negative urgency with emotion regulation and associated susceptibility to future vaping use. It is hypothesized that higher levels of negative and positive urgency will be associated with increased susceptibility to become a regular user of e-cigarettes in the future and that this relationship will be moderated by the degree of emotion dysregulation.

2. Methods

2.1. Participants

Participants were recruited from the Rochester Institute of Technology campus through flyers, emails, and through the Introduction to Psychology research participant pool. Participants were compensated with course credit or entry into a raffle to win one of four $25USD gift cards.

The initial sample consisted of 380 participants who took the survey. Of this 380, we removed anyone who indicated that they were a current smoker or e-cigarette user or if they indicated they have ever tried cigarettes, which resulted in 119 being removed. Finally, we removed any one that did not answer or failed the two attention check questions, which resulted in 36 participants being removed. The final sample included 225 participants. While there are different recommendations for what constitutes adequate sample size for SEM approaches (Hoe, 2008) two general rules are (1) 10 participants per free parameter estimated (Schreiber, Nora, Stage, Barlow, & King, 2006) and (2) a 'critical sample size' of 200 (Garver and Mentzer, 1999; Hoelter, 1983). This study meets both recommendations.

The sample consisted of 52.4% females and 45.8 males, with the

remaining participants indicating they preferred not to report. The mean age was 19.9 (SD = 1.82) years, with a range between 18 and 27 years of age. A majority of the sample identified as Caucasian (59.6%), followed by Asian (22.2%), African-American (6.2%), Hispanic (6.2%), and the remaining indicated other or preferred not to say (5.7%).

2.2. Measures

2.2.1. Emotion Regulation

To assess emotion regulation we used the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004), a common self-report measure. DERS attempts to measure emotion dysregulation with statements such as 'I am clear about my feelings,' with a rating of 1–5 for each statement (1 being the statement almost never applies to the participant, 5 being the statement almost always applies to the participant). Total DERS scores were calculated by taking the mean of all items and multiplying by the total number of items. This imputed scores for any missing item. Only 11 participants were missing item values and no participant was missing more than 3 items. Higher scores indicate greater emotional dysregulation. Cronbach's α for this scale was 0.940.

2.2.2. Vaping Susceptibility

Three questions (adapted from Choi et al., 2001) made up the vaping susceptibility variable; 1. 'Do you think you will try vaping or smoking e-cigarettes with nicotine soon?', 2. 'Do you think you will be nicotine vaping or smoking e-cigarettes one year from now?', and 3. 'If one of your best friends were to offer you a vape or e-cigarette containing nicotine, would you try it?'. All three questions were answered on a four point scale with 1 = 'definitely yes', 2 = 'probably yes', 3 = 'probably not', and 4 = 'definitely not'. No participants were missing values on these items. To create the variable for the path analysis we created a total score to represent vaping susceptibility with higher scores indicating greater susceptibility. Cronbach's α for this composite measure was 0.795.

2.2.3. Positive/Negative Urgency

To assess positive and negative urgency we used the UPPS-P Impulsive Behavior Scale – Short Version (Cyders, Littlefield, Coffey, & Karyadi, 2014). UPPS-P attempts to measure positive and negative urgency with statements such as 'I generally like to see things through to the end,' with a rating of 1–4 for each statement (with 1 being strong agreement with the statement and 4 being strong disagreement with the statement). We created total scores for each subscale by taking the mean of the items for the subscale and multiplying by the number of items.

This imputed scores for any missing items. For the two subscales we are using each only had one person that was missing one item. Higher scores indicate greater impulsivity. Cronbach's α was 0.779 for positive urgency subscale and 0.787 for the negative urgency subscale.

2.3. Procedure

All procedures were approved by the Rochester Institute of Technology Human Subjects Review Board. The survey was administered through the University's Qualtrics (www.qualtrics.com) system. Participants who saw the advertisements for the survey were directed to the webpage. Informed consent was obtained prior to participants starting the survey questions.

2.4. Data analysis

A path analysis was used to understand the role positive and negative urgency and emotion regulation have in predicting the susceptibility of future vaping. The path model is shown in Fig. 1. Means for each of the variables were calculated as mentioned above. The analysis was performed using IBM SPSS Amos Version 27.0.0 using maximum likelihood estimation. The model is saturated (just-identified) thus model fit is not reported. Indirect pathways from the two urgency variables to the susceptibility variable with the emotion regulation variable as the mediator where assessed in AMOS. Ten thousand bootstrap samples where used and biased corrected 95% confidence intervals and p-values are reported.

3. Results

Table 1 shows the correlations of the variables which ranged from 0.066 to 0.652. The emotion regulation score was positively correlated with negative urgency, positive urgency, and vaping susceptibility scores. While negative and positive urgency scores were positively

Table 1
Mean, SD, and Correlations for Study Variables.

Variable	M	SD	1	2	3	4
1. DERS	84.61	23.25	—			
2. Vaping Susceptibility	3.70	1.25	0.194*	—		
3. Negative Urgency	8.03	2.93	0.652**	0.066	—	
4. Positive Urgency	6.65	2.59	0.451**	0.116	0.620**	—

n = 225, * p < .01, **p < .001; DERS = Difficulties in Emotion Regulation Scale.
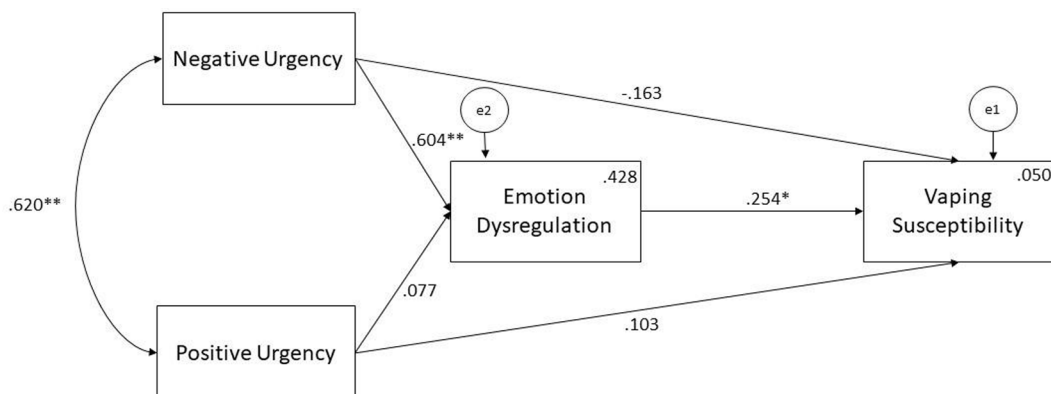
* p<.01, ** p<.001

Fig. 1. Standardized path coefficients for the tested model with squared multiple correlations.

correlated with each other, neither were correlated with susceptibility scores.

Negative urgency was a statistically significant predictor of emotion regulation (standardized regression coefficient = 0.604, unstandardized regression coefficient = 4.788 with a standard error of 0.510, p < .001). There was a trend for negative urgency to negatively predict vaping susceptibility (standardized regression coefficient = −0.163, unstandardized regression coefficient = −0.069 with a standard error of 0.042, p = .095). Positive urgency was not a significant predictor of either emotion regulation scores (standardized regression coefficient = 0.077, unstandardized regression coefficient = 0.688 with a standard error of 0.578, p = .233) or vaping susceptibility scores (standardized regression coefficient = 0.103, unstandardized regression coefficient = 0.049 with a standard error of 0.040, p = .218). Emotion regulation was a statistically significant predictor of vaping susceptibility scores (standardized regression coefficient = 0.254, unstandardized regression coefficient = 0.014 with a standard error of 0.005, p < .003). The indirect effect of negative urgency on vaping susceptibility through emotional regulation was significant, unstandardized estimate = 0.065, 95%CI = 0.022 to 0.116, p = .003. The indirect effect of positive urgency on vaping susceptibility through emotional regulation was not significant, unstandardized estimate = 0.009, 95%CI = −0.005 to 0.032, p = .160.

4. Discussion

This study examined the relationship between self-reported negative and positive urgency, emotion regulation, and susceptibility to future e-cigarette use in a sample of current non-users. Given past research linking negative and positive urgency to drug use, we predicted a direct relationship with higher levels of these traits associated with greater susceptibility. Likewise, we hypothesized that the effects of these impulsivity traits would be related to susceptibility indirectly through participants' ability to regulate their emotions. Contrary to our first prediction, the direct pathways from negative and positive urgency were not significantly predictive of susceptibility. When looking at the indirect pathway, we do see increased levels of negative urgency significantly predicting greater levels of emotional dysregulation, which in turn significantly predicts greater susceptibility. There was no significant relationship between positive urgency and emotion regulation. Overall these results suggest that it is the difficulty in regulating negative emotions that makes negative urgency a risk factor of future e-cigarette use in current non-users.

The lack of a significant direct relationship between negative and positive urgency and e-cigarette use susceptibility is unexpected given the literature on urgency and drug use. One potential reason for the discrepancy may be that previous literature has focused mainly on how urgency relates to cravings or the risk of relapse in individuals who are already dependent on a substance. This is in contrast to our study where we are looking at individuals who have not yet developed dependence to nicotine containing e-cigarettes. It may be that the effect of urgency is stronger after an individual learns that a drug can affect their emotional state and thus be an effective (albeit unhealthy) way of regulating emotion. This may be particularly true for positive urgency given that this state is associated with behaviors related to amplifying an already positive mood state. With limited prior experience with a drug, potential users may not know how the drug may affect them or add to their positive state. Indeed, the few studies on smoking behavior and urgency that are more prospective in nature (Dir et al., 2016; Spillane et al., 2013; Doran et al., 2013) find that outcome expectancies are important determinants of future smoking behavior, with individuals scoring higher in urgency having greater expectancies for positive outcomes associated with smoking.

Both negative and positive urgency were positively correlated with the emotion dysregulation scores but in the path model only negative urgency was associated with susceptibility though the mediating variable of emotion dysregulation. This finding is similar to that of Dir et al. (2016) where negative urgency interacted with emotion dysregulation to predict higher levels of positive social facilitation smoking expectancies in adolescents. Effortful control (EC), a concept that includes emotion regulation and behavioral inhibition, has been identified as a factor in drug use (Cheetham et al., 2010), with individuals low on EC thought to have more difficulty dealing with urges triggered by the experience of intense emotion. Furthermore, previous research has shown that lower emotion regulation skills are significantly correlated with higher levels of impulsivity in individuals suffering from a substance use disorder (Jakubczyk et al., 2018; Weiss et al., 2012). This pathway from negative urgency to emotion regulation difficulties to e-cigarette use susceptibility may reflect the important role that emotion regulation skills play in countering the effects of negative affect induced impulsivity on drug use. Emotion regulation strategies can take on countless forms but generally include categories such as situation selection, situation modification, attentional deployment, cognitive change, and response modulation (Gross, 2015). Improving regulation at any one of these points could help reduce the influence of negative urgency on drug use behavior.

While the amount of variance of the susceptibility variable explained was low, the relationship is still a clinically significant one given the increasing prevalence of vaping among younger individuals and the related potential negative health outcomes. The low variability may be due to the questions we used to construct the susceptibility variable. A handful of studies (Choi et al., 2001; Pierce et al., 1996; Trinidad et al., 2004) have used these questions to assess cognitive susceptibility to starting e-cigarette use or cigarette use. However, these studies often used the questions to classify participants into a dichotomous susceptibility variable (i.e. if participants answered definitely no to all questions they were classified as non-susceptible, otherwise participants were classified as susceptible). Regardless, these studies consistently find the questions to predict greater likelihood of future use.

The current study has a few limitations. One limitation is the generalizability of the findings. The sample consists of primarily young adult college students. Thus, we do not know if the results will apply to teenagers, younger adults who are not college students, or older adults. The college student demographic is important to study however as it is a time of experimentation and peer-pressure that is unlikely to be experienced by older adults who, if they are non-smokers, are unlikely to see a benefit to starting e-cigarette use or experience peer pressure to use. Another limitation of this study relates to the history of e-cigarette use of participants. The analysis included participants that were current e-cigarette non-users but 42 of the sample participants did indicate that they tried e-cigarettes in the past. Unfortunately, our dataset did not allow us to assess the level of past use in these individuals. Additionally, the limitations of the current study precluded us from being able to assess the future vaping behavior predicted by the susceptibility measures. However, previous studies (Choi et al., 2001; Pierce et al., 1996), which we have based our susceptibility questions on, have shown the questions to be valid predictors of increased risk of future nicotine use in longitudinal designs. Pierce, Choi, Gilpin, Farkas, and Merritt (1996) showed that those with high intentions based on these questions had an odds ratio of 3.15 of experimenting with nicotine four years later compared to an odds ratio of 1.92 for those with low intentions, and Choi et al. (2001) showed that intention to use predicted greater rates of established smoking three to four years later. Understanding the psychological factors that influence intent to start use, despite its limitations, can be important in understanding health behaviors and help in improving prevention efforts.

In conclusion, the results of this study suggest that emotion regulation is an important link between impulsivity related to negative emotional states (i.e. negative urgency) and the risk for future e-cigarette use in young adults. This suggests that public health initiatives targeting prevention of e-cigarette use in youth should focus on teaching emotion regulation skills to individuals high in negative urgency. Future research should focus on extending these results to adolescent

populations and should look at the predictive value of these variables in a longitudinal design.

5. Role of Funding Sources

6. Contributors

Reff and Baschnagel designed the study jointly. Reff collected the data, conducted literature searches and contributed in the writing of the manuscript. Baschnagel conducted the data analysis and contributed in the writing of the manuscript. Both authors approve the final manuscript.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Anestis, M. D., Selby, E. A., & Joiner, T. E. (2007). The role of urgency in maladaptive behaviors. *Behaviour Research and Therapy, 45*(12), 3018–3029.

Berking, M., Margraf, M., Ebert, D., Wupperman, P., Hofmann, S. G., & Junghanns, K. (2011). Deficits in emotion-regulation skills predict alcohol use during and after cognitive-behavioral therapy for alcohol dependence. *Journal of Consulting and Clinical Psychology, 79*(3), 307–318.

Bold, K. W., Kong, G., Cavallo, D. A., Camenga, D. R., & Krishnan-Sarin, S. (2018). E-Cigarette susceptibility as a predictor of youth initiation of e-cigarettes. *Nicotine & Tobacco Research*, 140–144.

Cheetham, A., Allen, N. B., Yücel, M., & Lubman, D. I. (2010). The role of affective dysregulation in drug addiction. *Clinical Psychology, 30*(6), 621–634.

Choi, W. S., Gilpin, E. A., Farkas, A. J., & Pierce, J. P. (2001). Determining the probability of future smoking among adolescents. *Addiction, 96*(2), 313–323.

Coifman, K. G., & Summers, C. B. (2019). Understanding emotion inflexibility in risk for affective disease: Integrating current research and finding a path forward. *Frontiers in Psychology*, 392.

Coleman, B. N., Rostron, B., Johnson, S. E., Ambrose, B. K., Pearson, J., Stanton, C. A., et al. (2017). Electronic cigarette use among US adults in the population assessment of tobacco and health (PATH) study, 2013–2014. *Tobacco Control, 26*(e2), e117–e126.

Cyders, M. A., Littlefield, A. K., Coffey, S., & Karyadi, K. A. (2014). Examination of a short version of the UPPS-P impulsive behavior scale. *Addictive Behaviors*, 1372–1376.

Cyders, M. A., & Smith, G. T. (2008). Emotion-based dispositions to rash action: Positive and negative urgency. *Psychological Bulletin, 134*(6), 807–828.

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.

Doran, N., Cook, J., McChargue, D., & Spring, B. (2009). Impulsivity and cigarette craving: Differences across subtypes. *Psychopharmacology, 207*(3), 365–373.

Doran, N., Khoddam, R., Sanders, P. E., Schweizer, C. A., Trim, R. S., & Myers, M. G. (2013). A prospective study of the acquired preparedness model: The effects of impulsivity and expectancies on smoking initiation in college students. *Psychology of Addictive Behaviors, 27*(3), 714–722.

Doran, N., & Tully, L. (2018). Impulsivity and tobacco product use over time. *Addictive Behaviors, 85*, 153–157.

Estévez, A., Jáuregui, P., Sánchez-Marcos, I., López-González, H., & Griffiths, M. D. (2017). Attachment and emotion regulation in substance addictions and behavioral addictions. *Journal of Behavioral Addictions, 6*(4), 534–544.

Fadus, M. C., Smith, T. T., & Squeglia, L. M. (2019). The rise of e-cigarettes, pod mod devices, and JUUL among youth: Factors influencing use, health implications, and downstream effects. *Drug and Alcohol Dependence, 201*, 85–93.

Fischer, S., Smith, G. T., Annus, A., & Hendricks, M. (2007). The relationship of neuroticism and urgency to negative consequences of alcohol use in women with bulimic symptoms. *Personality and Individual Differences, 43*(5), 1199–1209.

Flay, B. (1999). Understanding environmental, situational, and intrapersonal risk and protective factors for youth tobacco use: The theory of triadic influence. *Nicotine and Tobacco Research, 1*(1), 111–114.

Garver, M. S., & Mentzer, J. T. (1999). Logistics research methods: Employing structural equation modeling to test for construct validity. *Journal of Business Logistics*, 33–57.

Gentzke, A. S., Creamer, M., Cullen, K. A., et al. (2019). Vital signs: Tobacco product use among middle and high school students – United States, 2011–2018. USDHHS/CDC. pp. 157–164.

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. (2002). Emotion regulation: Affective, cognitive, and social consequences. *Psychophysiology, 39*(3), 281–291.

Gross, J. J. (2015). Emotion regulation: Current status and future prospects. *Psychological Inquiry*, 1–26.

Hill, E. M., & Maggi, S. (2011). Emotional intelligence and smoking: Protective and risk factors among Canadian young adults. *Personality and Individual Differences, 51*(1), 45–50.

Hoe, S. L. (2008). Issues and procedures in adopting structural equation modeling technicque. *Quantitative Methods Inquires*, 76–83.

Hoelter, D. R. (1983). The analysis of covariance structures: Goodness-of-fit indices. *Sociological Methods and Research, 11*(3), 325–344.

Jakubczyk, A., Trucco, E. M., Kopera, M., Kobyliński, P., Suszek, H., Fudalej, S., et al. (2018). The association between impulsivity, emotion regulation, and symptoms of alcohol use disorder. *Journal of Substance Abuse Treatment, 91*, 49–56.

Leatherdale, S. T., McDonald, P. W., Cameron, R., Jolin, M. A., & Brown, K. S. (2006). A multi-level analysis examining how smoking friends, parents, and older students in the school environment are risk factors for susceptibility to smoking among non-smoking elementary school youth. *Prevention Science, 7*(4), 397–402.

Lechner, W. V., Murphy, C. M., Colby, S. M., Janssen, T., Rogers, M. L., & Jackson, K. M. (2018). Cognitive risk factors of electronic and combustible cigarette use in adolescents. *Addictive Behaviors, 82*, 182–188.

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.

Lydon-Staley, D. M., & Geier, C. F. (2018). Age-varying associations between cigarette smoking, sensation seeking, and impulse control through adolescence and young adulthood. *Journal of Research on Adolescence, 28*(2), 354–367.

Morris, W. N., & Reilly, N. P. (1987). Toward the self-regulation of mood: Theory and research. *Motivation and Emotion, 11*(3), 215–249.

Pang, R. D., Farrahi, L., Glazier, S., Sussman, S., & Leventhal, A. M. (2014). Depressive symptoms, negative urgency and substance use initiation in adolescents. *Drug and Alcohol Dependence, 144*, 225–230.

Peña-Sarrionandia, A., Mikolajczak, M., & Gross, J. J. (2015). Integrating emotion regulation and emotional intelligence traditions: A meta-analysis. *Frontiers in Psychology*, 1–27.

Pierce, J. P., Choi, W. S., Gilpin, E. A., Farkas, A. J., & Merritt, R. K. (1996). Validation of susceptibility as a predictor of which adolescents take up smoking in the United States. *Health Psychology, 15*(5), 355–361.

Schreiber, L. R. N., Grant, J. E., & Odlaug, B. L. (2012). Emotion regulation and impulsivity in young adults. *Journal of Psychiatric Research, 46*(5), 651–658.

Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *The Journal of Educational Research, 99*(6), 323–338.

Services USDoHaH (2016). E-cigarette use among youth and young adults. A report of the surgeon general.

Shadur, J. M., & Lejuez, C. W. (2015). Adolescent substance use and comorbid psychopathology: Emotion regulation deficits as a transdiagnostic risk factor. *Curr Addict Rep, 2*(4), 354–363.

Spillane, N. S., Combs, J. L., Kahler, C. W., & Smith, G. T. (2013). Emotion-based impulsivity, smoking expectancies, and nicotine dependence in college students. *Addict Res Theory, 21*(6), 489–495. https://doi.org/10.3109/16066359.2012.748894.

Sutfin, E. L., McCoy, T. P., Morrell, H. E. R., Hoeppner, B. B., & Wolfson, M. (2013). Electronic cigarette use by college students. *Drug and Alcohol Dependence, 131*(3), 214–221.

Szasz, P. L., Szentagotai, A., & Hofmann, S. G. (2012). Effects of emotion regulation strategies on smoking craving, attentional bias, and task persistence. *Behavior Research and Therapy*, 334–340.

Thompson, R. A., Lewis, M. D., & Calkins, S. D. (2008). Reassessing emotion regulation. *Child Development Perspectives, 2*(3), 124–131.

Torres, A., Catena, A., Megías, A., Maldonado, A., Cándido, A., Verdejo-García, A., et al. (2013). Emotional and non-emotional pathways to impulsive behavior and addiction. *Frontiers in Human Neuroscience, 7.* https://doi.org/10.3389/fnhum.2013.00043.

Trinidad, D., Unger, J., Chou, C., Azen, S., & Johnson, C. (2004). Emotional intelligence and smoking risk factors in adolescents: Interactions on smoking intentions. *Journal of Adolescent Health, 34*(1), 46–55.

Weiss, N. H., Tull, M. T., Viana, A. G., Anestis, M. D., & Gratz, K. L. (2012). Impulsive behaviors as an emotion regulation strategy: Examining associations between PTSD, emotion dysregulation, and impulsive behaviors among substance dependent inpatients. *Journal of Anxiety Disorders, 26*(3), 453–458.

Werner, A. K., Koumans, E. H., Chatham-Stephens, K., Salvatore, P. P., Armatas, C., Byers, P., et al. (2020). Hospitalizations and deaths associated with EVALI. *The New England Journal of Medicine, 382*(17), 1589–1598.

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.