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ALCOHOL USE AND EMOTION DYSREGULATION IN ADOLESCENCE

A Thesis
Presented to
Faculty of the Department of Psychological Sciences
Western Kentucky University
Bowling Green, KY

In Partial Fulfillment
Of the Requirements for the Degree
Master of Science

By
Shelby A. King

May 2021

ALCOHOL USE AND EMOTION DYSREGULATION IN ADOLESCENCE

Date recommended 05/20/21

Jenni Teeters Digitally signed by Jenni Teeters
Date: 2021.05.20 10:36:57 -05'00'

Jenni Teeters, Director of Thesis

Amy Brausch, PhD Digitally signed by Amy Brausch, PhD
Date: 2021.05.20 10:13:18 -05'00'

Amy Brausch

Andrew Mienaltowski Digitally signed by Andrew Mienaltowski
DN: cn=Andrew Mienaltowski, o=Western Kentucky University,
ou=Psychological Sciences, email=drmski@wku.edu, c=US
Date: 2021.05.20 10:04:36 -05'00'

Dr. Andrew Mienaltowski



Associate Provost for Research and Graduate Education

I dedicate this thesis to my extraordinarily supportive family and friends.

I am forever grateful.

ACKNOWLEDGEMENTS

I would like to acknowledge my research mentor, Dr. Jenni Teeters. I greatly appreciate her knowledge and encouragement over the last two years. I would also like to offer my special thanks to Dr. Amy Brausch and Dr. Andrew Mienaltowski. I am thankful for the supportive mentorship I have received from these individuals.

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ALCOHOL USE AND EMOTION DYSREGULATION IN ADOLESCENCE

Shelby A. King

May 2021

45 Pages

Directed by: Jenni Teeters, Amy M. Brausch, and Andrew Mienaltowski

Department of Psychological Sciences

Western Kentucky University

Underage drinking is a serious public health concern with magnified physical and psychological risks for adolescents. Consequences can include impaired judgement, increased risk for alcohol problems later in life, increased risk of physical and sexual assault, interference with brain development, injuries, and death (National Institute on Alcohol Abuse and Alcoholism, 2021). In a 2019 survey, 29% of high school students reported drinking alcohol in the past 30 days (Centers for Disease Control and Prevention, 2020). Given the high rates of use and adverse effects associated with adolescent substance use, research on risk factors related to alcohol use among this age group is critical. Previous research suggests that emotion dysregulation is one factor linked to substance use (Gross, 2014). However, a majority of these studies included adult or college populations with very few studies examining the connection between emotion dysregulation and alcohol use in adolescence. Moreover, most studies utilized cross-sectional designs. The present study aimed to longitudinally examine the links between emotion dysregulation and alcohol use among adolescents by assessing the role of emotion dysregulation and its subscales in adolescent alcohol use and problems over time. Participants were 695 high school students, with 309 students having completed Time 2 data collection. Results indicated that adolescents with more emotion regulation difficulties were more likely to endorse greater baseline alcohol use and problems. However, greater emotion regulation difficulties did not significantly predict future

alcohol use and problems six months later. Concerning the emotion dysregulation subscales, results indicated that adolescents who reported greater impulse control difficulties at baseline were more likely to endorse greater baseline alcohol use and problems, and that adolescents who reported low emotional awareness at baseline were more likely to endorse greater alcohol use and problems at the six-month follow-up. These findings can be used to better inform substance use prevention and intervention efforts in high schools. Future research should examine if emotion dysregulation plays a role in other substance use behaviors commonly endorsed by high school students, such as cannabis use and simultaneous use of alcohol and cannabis.

Introduction

Substance use disorders are of great public concern affecting 19.7 million Americans (ages 12 and over) and costing society more than \$740 billion annually (National Institute on Drug Abuse, 2017). Moreover, substance use typically begins around adolescence, thus underscoring the importance of examining substance use behaviors and motivators in these young individuals (Dawson et al., 2008). According to the National Institute on Drug Abuse (2014), by the time adolescents are high school seniors, almost 70% will have consumed alcohol, 50% will have taken an illegal drug, 40% will have smoked a cigarette, and more than 20% will have used a prescription drug without a medical purpose. Due to the harmful effects on both individuals and society, research identifying risk factors for substance use is essential. One factor that has been connected to substance use is an individual's emotion regulation ability (Gross, 2014). This study aimed to investigate the links between emotion dysregulation and substance use among adolescents. The results of this study may help in the development of effective substance use prevention and intervention programs that focus on improving emotion regulation skills in adolescence.

Substance Use and Adolescence

Adolescence is often the period in which many individuals first use drugs and alcohol (National Institute on Drug Abuse, 2014). It is also the period that has been linked to frequent adverse outcomes concerning substance use (National Institute on Drug Abuse, 2014). Early age of onset for substance use greatly increases an individual's risk for future alcohol and drug-related problems and substance use disorders (Anthony & Petronis, 1995; DeWit, 2000). In a study of almost 6,000 lifetime drinkers, 13.5% of the

participants who began to drink at ages 11 and 12 met the criteria for a diagnosis of alcohol abuse, and 15.9% had a diagnosis of alcohol dependence (DeWit, 2000).

Furthermore, adolescent substance use has been linked to a multitude of negative consequences. One study linked early onset substance use to problems in domains such as behavior patterns, family systems, peer relationships, and work adjustment (Poudel & Gautam, 2017). Moreover, early substance use is associated with and predicts later psychiatric disorders, including major depressive disorder, and psychological distress in the form of depression, anxiety, and phobic anxiety (Brook et al., 2002; Hansell & White, 1991). In another study examining adolescent substance use consequences, youth diagnosed with substance problems were more likely to engage in risky sexual behaviors (Tapert et al., 2001). Such behaviors included earlier age of onset to sexual activity, more sexual partners, less consistent use of condoms, more sexually transmitted diseases (STDs), and greater prevalence of human immunodeficiency virus testing than sociodemographically matched community controls (Tapert et al., 2001).

Despite the multiple behavioral and psychological risks associated with early substance use, perhaps most disastrous are the effects drugs and alcohol have on the brain, especially the developing teenage brain. Exposure to substances during this critical period of neurological development may interrupt the natural course and key processes of brain maturation and development (Squeglia et al., 2009). Thus, it is important to intervene early before irrevocable damage occurs and lifetime problems develop. From these studies, it is evident that several harmful effects can result from adolescent substance use. Considering the multitude of potential adverse impacts, it is imperative

that a variety of risk factors, including dimensions of emotion regulation, are explored and analyzed.

Emotion Regulation/Dysregulation Terminology and Measures

The term emotion regulation has had many definitions depending on its context. The term has been used to describe a multitude of constructs surrounding internal, external, developmental, and psychopathological regulatory processes (Cole et al., 1994). Using a clinical perspective, one review defined emotion regulation as having the ability to respond to current demands of experience with a range of socially tolerable emotions and having the flexibility to respond and delay responses to spontaneous actions (Cole et al., 1994). Within this same review, emotion dysregulation's definition incorporated difficulties with emotional flexibility and inadequate control over emotional experiences and expressions. In a more recent study, Shadur and Lejuez (2015) defined emotion regulation as conscious or unconscious efforts, strategies, and responses that modify and maintain affective states and behaviors. Though similar descriptions, the two definitions highlight the lack of consensus within the field concerning the construct of emotion regulation.

That being said, emotion regulation, as defined by Gratz and Roemer (2004), has received considerable agreement and recognition (Weinberg & Klonsky, 2009). Gratz and Roemer (2004) defined emotion regulation as a multidimensional construct involving the awareness, understanding, and acceptance of emotions. An inability to execute these skills surrounding emotion is commonly referred to as emotion dysregulation (Gratz & Roemer, 2004). According to Gratz and Roemer's (2004) model of emotion regulation, the construct is comprised of four dimensions: (1) flexibility in the use of adaptive

strategies to control the intensity of an emotional response; (2) ability to resist impulsive behaviors and engage in goal-directed behaviors in the context of emotional distress; (3) emotional awareness, clarity, and acceptance and (4) willingness to experience emotional distress in the context of pursuing meaningful activities.

This definition of emotion regulation is commonly used across studies because it has a highly valid and reliable measure associated with it, termed the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). According to Weinberg and Klonsky (2009), the DERS is the most comprehensive measure of emotion regulation to date. The purpose of the DERS is to identify and assess emotion dysregulation. It is divided into six subscales: (1) nonacceptance of emotional responses, (2) difficulty engaging in goal-directed behavior, (3) impulse control difficulties, (4) lack of emotional awareness, (5) limited access to emotion regulation strategies, and (6) lack of emotional clarity (Gratz & Roemer, 2004). In a study of the measure's psychometrics, results suggested that the DERS has high internal consistency, good test-retest reliability, and adequate construct and predictive validity in a population of adults ages 18 to 55 years (Gratz & Roemer, 2004).

Moreover, psychometrics of the DERS was examined in a study with over 400 adolescents ages 13–17 years (Weinberg & Klonsky, 2009). Results suggested that the measure has good to excellent internal consistency, robust correlations with psychological problems including alcohol and drug use, and supportable reliability and validity for its use in adolescent populations (Weinberg & Klonsky, 2009). However, intercorrelations among the subscales ranged from insignificant to high, and gender differences occurred for some subscales. Specifically, the awareness subscale showed

low internal consistency for adolescents. It was hypothesized that the language used in the awareness items may not be appropriate for adolescent-use and more simple language may improve the measure (Weinberg & Klonsky, 2009). However, at present time, an adolescent version of the DERS does not exist.

Concerning gender, previous studies have suggested that male and female children and adults utilize different emotion regulation strategies (Else-Quest et al., 2012; Zeman et al., 2006). Aligning with prior research, Weinberg and Klonsky (2009) found differences between male and female adolescents on three subscales: goals, strategies, and clarity. Although no current research examines the psychometric properties of the DERS across genders in an adolescent sample, research on a sample of adults (ages 18-58 years) suggested that the DERS comparably captures the frequency and intensity of emotion dysregulation for both males and females (Ritschel et al., 2015). Thus, though genders appeared to utilize different emotion strategies, the DERS was able to measure the construct appropriately. Despite the language limitation involved in the awareness subscale, the DERS remains a valuable instrument for future studies measuring emotion regulation because of its acceptable reliability and validity in adolescent populations.

Emotion Regulation and Substance Use in Adults

In the context of substance use, many studies have examined how emotion regulation plays a role in alcohol and drug use behaviors. Although most of the research has been conducted with adult populations, understanding emotion regulation in this context elucidates the construct for adolescence. Kober and Bolling's (2014) book chapter explains how substances can be used to regulate emotions. Depending on the type of substance, the use of substances can either increase positive emotions (i.e., create

feelings of pleasure) or alleviate negative emotional states (i.e., decrease feelings of anxiety). They hypothesized that some individuals might use substances to adjust and control emotional states physiologically, rather than regulate their emotions internally. This idea has been named the self-medication hypothesis (Khantzian, 1997). The theory posits that individuals use substances to alter their original affect states. For example, an individual with a predisposition to anxiety may be more likely to develop a substance use disorder for a substance that reverses those negative feelings, such as alcohol because of its numbing effects. Research with adolescents (ages 13-14 years) has suggested that social learning processes and self-medication are possible reasons teens use substances (Tomlinson & Brown, 2012). Consequently, self-medication may be a motivation for use in both adolescent and adult populations.

Additionally, it was theorized that poor emotion regulation skills may be one significant contributor and predictor, among many others, to substance use disorders (Kober & Bolling, 2014). In this scenario, an inability to regulate one's emotions may lead to the use of substances. Thus, prior emotion dysregulation may be a potential risk factor for substance use behaviors. Multiple studies have examined emotion dysregulation as a mediator between an occurrence, such as child abuse, posttraumatic stress disorder (PTSD) symptoms, or hoarding behaviors, and substance use (Mandavia et al., 2016; Raines et al., 2017; Tull et al., 2015). However, little research has examined emotion regulation as a predictor of substance use. Moreover, no studies have assessed direct links between youth emotion dysregulation and substance use behaviors as an adolescent or adult using the validated DERS measure. Research that examines the significance of adolescent emotion dysregulation and future substance use behaviors is

needed critically. Whether adolescent emotion dysregulation plays a role in substance use behaviors is an important research question that needs to be addressed in the literature.

It is imperative to examine regulatory processes in youth as they can have a substantial effect on subsequent developmental outcomes. Research involving the well-known preschool marshmallow experiment conducted by Shoda and colleagues (1990) measuring delayed gratification supports the assertion that early self-regulatory processes greatly impact future developmental outcomes (Mischel et al., 2011). Associations have been found between early self-regulatory process and outcomes ranging from SAT scores, emotional coping skills, to cocaine use (Mischel et al., 2011). From this line of research, it can be postulated that early acquired emotion regulation skills may impact future substance use behaviors.

Emotion Regulation and Substance Use with DERS

Using a consistent operational definition of emotion regulation allows for more unambiguous comparisons between studies, so the studies reviewed in this section utilized the DERS to measure emotion dysregulation (Azizi et al., 2019; Fox et al., 2007, 2008). All studies found deficits in emotion regulation for substance use groups compared to control groups. Azizi and colleagues (2019) examined emotion regulation difficulties and coping strategies across three groups: opioid users, methadone maintenance users, and community controls. All participants were males between the ages of 21 and 38 years. Results indicated significant emotion regulation differences between the opioid and methadone maintenance users versus the control group. Specifically, individuals using opioid and methadone maintenance showed increased

difficulties in the DERS subscales of impulsivity, emotion awareness, and emotion clarity.

Similarly, recently abstinent cocaine patients showed increased difficulties in the DERS subscales of impulse, emotion awareness, strategies, and emotion clarity (Fox et al., 2007). However, unlike the study conducted by Azizi and colleagues (2019), Fox and colleagues (2007) measured DERS subscales at baseline and three to four weeks later. At Time 2, recently abstinent cocaine patients showed improvements in emotion regulation strategies, emotion clarity, and emotion awareness, but no significant changes in the impulse subscale. In an analogous study with recently abstinent alcoholics, researchers also found problems of emotion awareness and impulsivity at baseline measurement (Fox et al., 2008). Furthermore, at Time 2 five weeks later, alcoholics showed improvements in emotion awareness and clarity, but no significant changes in impulsivity. These results suggest that impulsivity may be a significant component of substance use. Moreover, they indicate that with longer periods of abstinence, certain facets of emotion regulation improve but impulsivity may be more of a constant underlying trait. However, further research examining the subscales of emotion dysregulation is required before conclusions can be established. It is possible, however, that the use of recently abstinent substance users affected the results because these individuals were under an unusually high level of distress. Additionally, three to five weeks may not have been enough time to produce change.

Emotion Regulation and Substance Use in College Students

Nonetheless, it is apparent from these three studies that individuals with substance misuse histories show increased difficulties in their abilities to regulate emotions.

Though emotion dysregulation has been studied thoroughly in populations of adults with consistent substance use, limited research has examined facets of emotion dysregulation in individuals with less extensive histories of substance use, particularly adolescents. Fortunately, some studies have examined these topics in college students, whose substance use histories can more suitably be compared to adolescents (Dvorak et al., 2014; Kassel et al., 2000; Schreiber et al., 2012; Weiss et al., 2018). A study of 1,758 college students that utilized the DERS found that emotion regulation difficulties were broadly associated with alcohol-related consequences (Dvorak et al., 2014). Specifically, results suggested that the facets of impulse control difficulties, non-acceptance of emotional responses, lack of emotional clarity and difficulties engaging in goal-directed behavior were positively related to the number of alcohol-related consequences endorsed (Dvorak et al., 2014).

Additionally, Weiss and colleagues (2018) used structural equation modeling to examine the relationship between regulating positive emotions and alcohol misuse in college students and found that greater difficulty regulating positive emotions was related to greater alcohol misuse in a hypothesized model. The model was significant in the direction of difficulties regulating positive emotions leading to alcohol use. These results suggested that positive emotion regulation difficulties may precede alcohol misuse. Though small, the effects of emotion regulation difficulties on alcohol use for both studies (Dvorak et al., 2014; Weiss et al., 2018) were significant and warrant investigation in the context of adolescence. Research investigating the associations between DERS subscales and substance use patterns among adolescents would help fill the evident research gap with these individuals.

Prospective Research on Emotion Regulation

Longitudinal research is essential because it provides the directionality of variables if variables are measured at all time points. Despite the necessity of longitudinal research, limited research has used longitudinal designs to study the variables of emotion dysregulation and substance use in adolescent populations. This research would help clarify the associations between emotion dysregulation in adolescence and substance use behaviors. Additionally, research may provide essential information that could be utilized in prevention and intervention programs.

Though substance use was not included, a previous study longitudinally examined the links between emotion regulation deficits and psychopathology and found associations between adolescent emotion regulation deficits and later psychopathology (McLaughlin et al., 2011). Data on psychopathological symptoms and emotion dysregulation measures including depression, anxiety, aggressive actions, eating behaviors, poor emotional understanding, inappropriate emotion expressions of sadness and anger, and rumination were collected at baseline and again seven months later. Results indicated that emotion dysregulation predicted psychopathologies for all disorders except depression when controlling for baseline emotion dysregulation levels. Alternatively, none of the disorders predicted increases in emotion dysregulation when controlling for baseline levels. Researchers concluded that emotion regulation deficits are significant factors that increase the risk of psychopathological symptoms across a range of disorders in adolescence. Though McLaughlin and colleagues did not measure substance use behaviors, the results emphasize the importance of emotion regulation in

multiple mental health diagnoses. Emotion dysregulation's transdiagnostic characteristics make it a promising factor for substance use disorder risk as well.

Two longitudinal studies have examined substance-related behaviors and emotion dysregulation in adolescence (Hessler & Katz, 2010; Kliewer et al., 2016). Hessler and Katz (2010) studied the associations among emotion awareness, emotion regulation, comfort with emotional expression, and the use of illicit drugs at baseline and seven years later. Kliewer and colleagues (2016) examined emotion dysregulation, anticipatory cortisol, and a wider range of substance use behaviors including smoking, and alcohol and drug use by collecting measures of adolescents' emotion dysregulation at baseline and one and two years later, and measures of substance use at baseline and three years later. Interestingly, the first study, Hessler and Katz (2010) found that those with low emotion regulation and awareness at baseline had a higher probability of using illicit drugs, such as amphetamines, cocaine, crack, LSD, heroin, other narcotics, methamphetamines, and ecstasy seven years later. The second study, Kliewer and colleagues (2016) found similar results in that emotional dysregulation was prospectively associated with blunted anticipatory cortisol, which in turn was associated with increased substance use when baseline substance use and age were controlled. However, these associations were only observed for females. It is unclear why only one study found gender differences, and supplementary research investigating these variables is needed. Nevertheless, it is possible that the broader range of substance use behaviors included in the study conducted by Kliewer and colleagues (2016) resulted in different outcomes than if they had only measured illicit drug use as in the other study. Moreover, the demographics of the two samples were drastically different. The sample collected by

Hessler and Katz (2010) was majority Caucasian, and 49% of the families had a family income of over 90,000 dollars. Contrastingly, Kliewer and colleagues (2016) sampled majority African American participants, and 54% had household incomes below the poverty line. Given the inadequate number of studies examining emotion dysregulation and substance use behaviors in adolescence over time, in addition to the dissimilar conclusions of the two previous studies, it is clear that further research is crucial.

Rationale for Current Study

Examination of how emotion dysregulation affects substance use behaviors in adolescence reveals multiple measures, methods, operational definitions, and samples among studies. Despite the inconsistencies in research specifics, it is evident that emotion regulation is an important factor in substance use behaviors in both adult and adolescent populations. However, the question of how the two constructs relate over time in adolescent populations remains. Present research emphasized the amplified risks of substance use for adolescents, as well as explored the many definitions and perspectives of emotion regulation and its measures. Multiple studies suggest that individuals who have misused substances currently or in the past exhibit emotion regulation deficits. Moreover, similar patterns have been found in adult, young adult, and adolescent populations, and prospective research suggests that emotion regulation may be a risk factor for psychopathology, including substance misuse, for adolescents. However, additional research is needed to identify conditions surrounding the associations between adolescent emotion dysregulation and substance use behaviors.

Overall, these findings underscore the importance of further researching these constructs in the context of adolescence. Consequently, the aim of the current study was

to longitudinally measure emotion dysregulation and substance use, specifically alcohol use, in adolescence to assess their associations and how various facets of emotion dysregulation relate to alcohol use and problems over time. Given that alcohol is the most commonly used substance among adolescents, along with the dearth of research examining emotion dysregulation and alcohol use in this age group, the present study focused specifically on alcohol use and related problems. Prospective research with a demographically representative sample provided a more comprehensive understanding of emotion regulation as a risk factor for alcohol misuse. Additionally, the use of the DERS in measuring emotion dysregulation helped identify facets of emotion dysregulation that are most relevant to adolescent alcohol use behaviors. Due to the many adverse consequences of adolescent substance use, the lack of literature in this domain, and the evidence in support of the association between emotion regulation deficits and substance use, it is clear that the current study examining emotion dysregulation as a risk factor for alcohol use in adolescence is essential.

With the multitude of research in support of the relationship between emotion dysregulation and current substance use disorders, it was hypothesized that adolescents with more emotion regulation difficulties at baseline would endorse greater alcohol use and problems at baseline. Moreover, it was expected that emotion regulation difficulties at baseline would longitudinally predict alcohol use and problems six months later at Time 2. Lastly, the proposed study took an exploratory look at the subscales of the DERS (nonacceptance, goals, impulse, awareness, strategies, and clarity) to determine if certain subscales were more associated with alcohol use and problems at baseline than others. A similar analysis was conducted to examine if certain subscales were more

predictive of alcohol use at Time 2 than others. Results from this study help illuminate the complex relations and processes surrounding adolescent substance misuse.

Method

Participants

Participants were 695 students from high schools in southeastern Kentucky recruited to participate in a larger longitudinal study. Following permission from schools and legal guardians, males and females from 9th to 12th grade were sampled. Students were compensated \$5 for completing questionnaires for Time 1 (T1) and an additional \$10 for completing questionnaires for Time 2 (T2) six months later. Among the 695 students, 309 students completed data collection at T2. Due to the sensitive topics discussed in the questionnaires (i.e., suicide, substance use), students were assured that all information collected would be confidential and there would be no consequences as a result of their responses unless their responses indicated that they were at risk for suicide. Participants were 54.7% female, 43.9% male .3% transgender, and .4% “other”, and 84.7% Caucasian, 3.9% African American, 3.2% Asian, .1% American Indian, 4.9% multi-ethnic, and the remainder not specifying their ethnicity. Additionally, 5.3% identified as Hispanic. Concerning grade level, 47.5% were freshman, 28.8% sophomore, 21.0% junior, and 1.4% senior.

Procedure

Prior to data collection, the proposed study was reviewed by Western Kentucky University’s Institutional Review Board and approved. Participating high schools sent permission forms to legal guardians, and students who received permission from their legal guardians were recorded onto a list of prospective participants. On designated data

collection days, research assistants consisting of trained graduate and undergraduate students collected data from students in either a classroom or a large school library space. Students were strategically placed to ensure privacy during the study. Each student was given a written assent form that described the study and asked to sign the form if they agreed to participate. This form implied consent for data collection at T1 and at T2, six months later. If a student declined participation, they returned to class without penalty. Research assistants then distributed the self-report measures and remained in the room while students completed the forms. Some measures were completed on iPads and others completed with paper forms. Following completion of the measures, research assistants screened pre-identified items that would indicate clinical risk for depression and/or suicide. This screening process was described in the legal guardian's consent form and the student's assent form. The research team completed intervention records for students identified as at risk and made referrals to school counselors. Students were paid \$5 at baseline and \$10 at T2 collection point, for a total of \$15 for completing both time points. Lastly, students were given a debriefing sheet.

Measures

Demographics. Participants completed a brief questionnaire regarding age, race/ethnicity, gender, and class status.

Difficulties in emotion regulation scale. The Difficulties in Emotion Regulation Scale (DERS) is a 36-item self-report questionnaire that was used to assess emotion dysregulation (Gratz & Roemer, 2004). Emotion dysregulation was measured as a total score and on six subscales: (1) nonacceptance of emotional responses, (2) difficulty engaging in goal-directed behavior, (3) impulse control difficulties, (4) lack of emotional

awareness, (5) limited access to emotion regulation strategies, and (6) lack of emotional clarity. Participants were asked to indicate how often each statement applied to them on a five-point Likert scale from “almost never (0-10%)” = 1 to “almost always (91-100%)” = 5. A total emotion regulation score was computed by adding the 36 items for a total DERS score. In addition, total scores for each DERS subscale (nonacceptance, goals, impulse, awareness, strategies, and clarity) were calculated. The total DERS score and scores within each subscale were represented on a continuous scale with higher scores indicating greater emotion regulation difficulties. Validity measures of this questionnaire indicated high internal consistency ($\alpha = 0.86$) and acceptable reliability ($r = 0.74$; Gratz & Roemer, 2004). Internal consistency for the current study was also high ($\alpha = 0.95$). Additionally, internal consistency scores for each subscale were calculated and shown in Table 1.

Alcohol use disorders identification test. The Alcohol Use Disorders Identification Test (AUDIT) is a 10-item self-report questionnaire that was used to assess alcohol consumption frequency and problems caused by alcohol (Saunders et al., 1993). It has a nominal response format coded 0 to 4. An example of a frequency question was, “How many standard drinks containing alcohol do you have on a typical day when drinking?” with answers “Never” (coded 0), “Monthly or less” (coded 1), “2-4 times a month” (coded 2), “2-3 times a week” (coded 3), or “4 or more times a week” (coded 4; Saunders et al., 1993). An example of a problem identification question was, “During the past year, have you been unable to remember what happened the night before because you had been drinking?” with answers “Never,” “Less than monthly,” “Monthly,” “Weekly,” or “Daily or almost daily” (Saunders et al., 1993). Research supports the use

of the AUDIT for adolescents ages 14 to 18, suggesting cut points of 2 for identifying any alcohol problem use and 3 for alcohol abuse or dependence (Knight et al., 2003). For the purpose of the present study, scores were continuous with higher scores representing greater alcohol use and related problems. A comprehensive review of the psychometric properties of the AUDIT found the measure to have high internal consistency ($\alpha = 0.80$) and reliability ($r = 0.85$; de Meneses-Gaya, Zuardi, Loureiro, & Crippa, 2009). Internal consistency for the current study was high for baseline measurement ($\alpha = .81$) and acceptable for T2 ($\alpha = .71$).

Data Analysis Plan

Analyses were conducted using SPSS version 27.0. Baseline descriptive characteristics of the overall sample were conducted, including demographic information (gender, ethnicity, grade) as well as the means and standard deviations for the outcome variables (T1 AUDIT total score, T2 AUDIT total score).

A negative binomial regression analysis was utilized to test the first hypothesis that adolescents with more emotion regulation difficulties at baseline would endorse greater alcohol use and problems at baseline. The baseline total score of the DERS was entered as the predictor variable. The baseline AUDIT total score served as the outcome variable representing alcohol use and problems. This statistical test examined whether greater emotion regulation difficulties at baseline were associated with baseline levels of alcohol use and problems. Negative binomial regression was chosen because our dependent variable, AUDIT, is an overdispersed count variable (i.e., the variance exceeds the mean).

Negative binomial regression was also used to test the second hypothesis that Time 1 emotion regulation difficulties would longitudinally predict alcohol use at the six-month follow-up. The baseline DERS total score and baseline AUDIT total score were entered as predictor variables. The T2 AUDIT total score served as the outcome variable representing alcohol use and problems at Time 2. This statistical test examined whether baseline emotion regulation difficulties predicted alcohol use and problems at T2, above and beyond baseline AUDIT total score.

Lastly, negative binomial regression analyses were conducted to test the exploratory hypotheses that certain DERS subscales were more predictive of alcohol use than other subscales. To examine whether specific DERS subscales predict alcohol use and problems at baseline, a negative binomial regression analysis was utilized with the six baseline DERS subscale scores as the predictor variables and baseline AUDIT total score as the outcome variable. To examine if certain DERS subscales were more predictive of alcohol use and problems at T2 than others, the six baseline DERS subscale scores and baseline AUDIT total score served as predictor variables and T2 AUDIT total score was the outcome variable.

Results

Descriptive Statistics

On average, students at baseline reported a score of 0.94 ($SD = 2.52$) on the AUDIT, representing alcohol use and problems. For AUDIT total score, 76.3% reported a score of 0 at baseline, 17.5% reported a score of 2 or greater, and 11.2% reported a score of 3 or greater. At the six-month follow-up (T2), students reported an average AUDIT total score of 1.05 ($SD = 2.85$) and 71.1% reported a score of 0, 19.8% reported a

score of 2 or greater, and 13.3% reported a score 3 or greater. Means and standard deviations of all variables at Time 1 and Times 2 are shown below in Table 1 and correlations in Table 2.

Hypothesis 1

Table 3 reports the results of the negative binomial regression model with baseline alcohol use and problems (AUDIT total score) as the outcome variable and baseline emotion dysregulation (DERS total score) as the predictor variable. Greater emotion dysregulation scores were significantly associated with an increased likelihood of alcohol use and problems (IRR = 1.023, $p = .000$).

Hypothesis 2

Table 4 shows the results of the negative binomial regression model controlling for baseline alcohol use and problems. In this model, baseline alcohol use and problems scores were significantly associated with an increased likelihood of alcohol use and problems at the six-month follow-up (IRR = 1.348, $p = .000$). Baseline emotion dysregulation scores were not significantly associated with T2 alcohol use and problems (IRR = 1.001, $p = .919$).

Exploratory Hypotheses

Table 5 reports the results of the negative binomial regression model with baseline alcohol use as the outcome variable and baseline DERS subscale scores (nonacceptance, goals, impulse, awareness, strategies, clarity) as the predictor variables. Greater impulse control difficulties were significantly associated with an increased likelihood of alcohol use and problems (IRR = 1.066, $p = .038$).

Table 6 shows the results of the negative binomial regression model examining the six DERS subscales and controlling for baseline alcohol use and problems. In this model, baseline alcohol use and problems scores were significantly associated with an increased likelihood of alcohol use at the six-month follow-up (IRR = 1.340, $p = .000$). Additionally, greater lack of emotional awareness scores at baseline were significantly associated with alcohol use and problems at T2 (IRR = 1.082, $p = .005$).

Discussion

Alcohol use among adolescents is a significant public health concern, and this early use amplifies many of the negative physical, emotional, relational, and psychological consequences and risks of substance use. Research examining alcohol use factors and motivators, like emotion dysregulation, in these young individuals is critical. The purpose of the present study was to longitudinally measure emotion dysregulation and alcohol use in adolescence to assess their relationships and how facets of emotion dysregulation relate to alcohol use over time. Overall results provide support for an association between emotion dysregulation and alcohol use and problems in adolescent populations.

Hypothesis 1 was supported in that adolescents with more emotion regulation difficulties at baseline endorsed greater alcohol use and problems at baseline. This finding adds important information to the literature on emotion dysregulation and alcohol use and problems by expanding the work to include adolescents. Additionally, the finding aligns with Dvorak and colleagues (2014), who found that college students with more emotion regulation difficulties endorsed greater alcohol-related consequences (Dvorak et al., 2014). Moreover, this finding is supported by past research showing

greater deficits in emotion regulation for substance use groups than control groups in samples of recently abstinent adults (Azizi et al., 2019; Fox et al., 2007, 2008). These studies and the current study suggest emotion dysregulation is a significant contributor to current and past alcohol use, problems, and alcohol-related consequences for various populations.

Recognizing this meaningful relationship between emotion dysregulation and substance use, interventions targeting emotion regulation may positively impact drinking levels in adolescence. Sloan and colleagues (2018) examined the efficacy of such an intervention in a mixed methods case series design with ten participants between the ages of 16-20 receiving residential treatment for alcohol and other drugs. Following completion of an Emotion Regulation and Impulse Control (ERIC) intervention, 60% of the participants reported clinically significant reductions in overall emotion dysregulation, and the intervention was rated to be both acceptable and feasible within this population. Future research is needed to determine whether changes in emotion dysregulation lead to decreases in alcohol and drug use. Given the finding from the present study that adolescents with more emotion regulation difficulties at baseline endorsed greater alcohol use and problems at baseline, future research should consider examining interventions similar to the ERIC in non-clinical samples. Considering the promising results from the ERIC intervention with young people in treatment, it is probable that non-treatment seeking adolescents would also benefit from an intervention targeting emotion dysregulation.

Hypothesis 2 was not supported in that emotion regulation difficulties at baseline did not longitudinally predict alcohol use and problems six months later at Time 2.

Rather, results showed that baseline alcohol use and problems significantly predicted alcohol use and problems at Time 2. These results suggest that when including baseline alcohol use and problems in the model, baseline emotion dysregulation is not predictive of future alcohol use and problems. Though baseline alcohol use and problems were the strongest and only predictor of future alcohol use and problems in the model, emotion dysregulation measured as one construct may be too broad to capture longitudinal predictions. In another study of prospective research of emotion dysregulation and substance use, Hessler and Katz (2010) assessed emotional competence and the probability of using illicit drugs. Their measure of emotional competence was conceptualized on three dimensions: awareness/understanding, expressivity, and regulation. As demonstrated in the findings within the exploratory hypotheses discussed further below, parsing out emotion dysregulation into subscales helps elucidate which facets of emotion dysregulation are predictive of future alcohol use and problems. Additionally, it is possible that a longer time frame is needed to capture longitudinal effects and six-months was insufficient. Future research should assess variables across a larger timespan such as 12 or 18 months.

Regarding the first exploratory hypothesis involving the subscales of the DERS (nonacceptance, goals, impulse, awareness, strategies, and clarity), greater impulse control difficulties at baseline were found to be significantly associated with an increased likelihood of alcohol use and problems at baseline. This finding aligns with many other studies that have found links between substance use and impulsivity (Azizi et al., 2019, Dvorak et al., 2014, Fox et al., 2008, Fox et al., 2007, Verdejo-García et al., 2008). Notably, in three studies comparing substance use groups to community controls,

individuals in all three substance use groups (users of opioid and methadone maintenance, recently abstinent cocaine patients, and recently abstinent individuals who struggled with alcohol use disorders) shared increased difficulties in the DERS subscale of impulsivity. Furthermore, substance use groups demonstrated sustained difficulties in impulsivity following treatment, thus underscoring this subscale's significance (Fox et al., 2008, Fox et al., 2007).

Also, in a sample of college students, facets of impulse control difficulties were positively related to the number of alcohol-related consequences endorsed (Dvorak et al., 2014). Our study extends this finding to adolescents. The above studies and the current finding align with an extensive review that suggests impulsivity may be a pre-existing vulnerability marker for substance use disorders (Verdejo-García et al., 2008). The subscale of impulse control difficulties is associated with substance use in adult and college populations, and as supported in the current study, impulse control difficulties are associated with adolescent alcohol use and problems.

Given that greater impulse control difficulties at baseline are linked with an increased likelihood of alcohol use and problems at baseline among adolescents in the present sample, interventions targeting impulsivity in adolescents may improve alcohol use outcomes. In a review of self-control interventions, several cognitive and behavioral interventions aimed at promoting self-control and reducing impulsivity have found promising findings among children and adults, and results suggest that these interventions may help with a wide range of diseases and disorders concerned with impulse-control (Smith et al., 2019). For example, one behavioral intervention targeted delay tolerance, the ability to suitably tolerate delays, among children with attention deficit hyperactivity

disorder (Binder et al., 2000). The study found that improving tolerance positively affected choice behavior and self-control among participants (Binder et al., 2000). Findings from the present study indicate that application of such interventions targeting self-control and related constructs may reduce impulse control difficulties in adolescents and improve drinking outcomes.

Concerning the second exploratory hypothesis that certain subscales of the DERS are more predictive of future alcohol use and problems, it was found that a greater lack of emotional awareness at baseline was predictive of alcohol use and problems at Time 2. This finding suggests that lack of emotional awareness is a significant predictor of future alcohol use and problems among adolescents, even when baseline alcohol use and problems were included in the model. Hessler and Katz (2010) examined longitudinal associations between emotion dysregulation (measured using the Child and Adolescent Meta-Emotion Interview) and illicit drug use in a sample of 88 children at age 9 (Time 1) and age 16 (Time 2). They found that individuals with low emotional awareness in childhood had a higher probability of using illicit drugs seven-years later. Interestingly, the study assessed awareness of the emotions of sadness and anger and found that the model including anger was significant, suggesting that lack of awareness of anger in middle childhood predicted illicit drug use during adolescence. The present study extends the findings of Hessler and Katz (2010) by showing that lack of emotional awareness is connected to future alcohol use and problems among adolescents. Future studies should examine if awareness of certain emotions is also connected to alcohol use and problems.

Based on the current study's finding that lack of emotional awareness predicts adolescent alcohol use and problems six months later, interventions targeting emotional awareness, such as mindfulness-based interventions (MBIs), may improve adolescent substance use outcomes. Mindfulness interventions aim to increase awareness of one's thoughts, feelings, bodily sensations, and environment by promoting acceptance and attention of thoughts and emotions without judgement (Sancho et al., 2018). For adolescents with low awareness of their emotions and higher likelihood to turn to risky behaviors to cope, increased mindfulness may help these individuals by equipping them with emotion regulation-related skills. In a systematic review of 54 controlled trials measuring the efficacy of MBIs for substance and behavioral addictions in adults, results suggested that interventions were successful in improving mood state and emotion dysregulation, and in decreasing craving and dependence symptoms (Sancho et al., 2018). Although the review did not include adolescents, another review of MBI efficacy did include studies with children and adolescents and found improved mental health outcomes for those in MBIs relative to controls (Dunning et al., 2018). Taken together, these reviews highlight the potential of using MBIs to increase emotional awareness and reduce alcohol use and problems in adolescence.

Limitations of the current study include that alcohol use and problems data were collected via retrospective self-reports. The data may have been subject to biases because sensitive substance use information was collected in a school setting, which may have negatively influenced accurate reporting. However, previous research with adolescents found that most school teenagers gave consistent reports of substance use involvement (Winters et al., 1990). Furthermore, the current study attempted to reduce potential

biases by placing students in a private location and assuring confidentiality and anonymity of responses that did not indicate suicide risk. This was done by having participants complete alcohol use and problems questions on an iPad rather than paper and pencil to provide increased anonymity. Nonetheless, future studies should utilize Ecological Momentary Assessment (EMA) or daily diary reporting to track substance use. These methods reduce errors by assessing participants more frequently to prevent memory inaccuracies and by assessing participants privately through apps or text messaging to encourage honesty.

Additionally, due to COVID-19, a six-month follow-up could not be collected from a significant proportion of the participants. As stated in the participant description, of the 695 students assessed at T1, 309 students completed data collection at T2. Though the follow-up rate was only 44%, a sample size of over 300 adolescents across a six-month timespan is notable and allowed for adequately powered analyses. However, future studies would benefit from collecting data from more adolescents and extending follow-up timespans to one year or longer to examine if associations persist across time.

Furthermore, a limitation of the current study was that an adolescent version of the DERS does not exist. Optimally, measures utilized in a study would be designed and tested for specific populations. Though previous analysis of the DERS with adolescent populations has found the measure to have adequate psychometrics, the awareness subscale was found to have low internal consistency compared to the other subscales (Weinberg & Klonsky, 2009). However, the present study found the awareness subscale to have good internal consistency ($\alpha = .82$) and was very comparable to the other

subscales, Nevertheless, this should be taken into account when interpreting the findings from our second exploratory hypothesis.

Despite these limitations, this study has significant public health relevance as it identifies emotion regulation and the subscales of impulsivity and emotional awareness as risk factors for alcohol use and problems in adolescents. This information can be incorporated into prevention and intervention programs in schools and beyond to improve alcohol use outcomes. Moreover, the current study fills a gap in the literature by longitudinally examining these constructs across time. Few studies have longitudinally measured substance use and emotion regulation, and even fewer studies have examined these topics among adolescent populations. A longitudinal analysis allows for the examination of risk factors over time and is greatly needed in the adolescent substance use literature. Lastly, the data was collected from adolescents in grades 9-12 in southeastern Kentucky. This demographically representative sample increases the generalizability of the findings and allows for applicability to similar populations.

The current study provides valuable information concerning the role of emotion dysregulation and its facets in current and future adolescent alcohol use and problems. Notably, results confirmed that adolescents with more emotion regulation difficulties were more likely to endorse greater current alcohol use and problems. Secondly, the study narrowed in on the construct of emotion dysregulation and found that adolescents who reported greater impulse control difficulties at baseline were more likely to endorse greater current alcohol use and problems. Lastly, in a longitudinal analysis, findings suggested that adolescents who reported low emotional awareness at baseline were more likely to endorse greater alcohol use and problems six months later. Collectively, these

results help identify and illuminate the conditions surrounding associations between adolescent emotion dysregulation and substance use behaviors and offer helpful prevention and intervention information.

Though this study helps explain some of the complexities surrounding alcohol use in adolescence, many questions remain that can be explored in future studies. Future studies should examine gender and grade level as moderators of the connection between emotion dysregulation and alcohol use and problems. Given the gender moderation findings from Kliewer and colleagues (2016), which suggests that emotion dysregulation is prospectively associated with increased adolescent substance use for females only, similar patterns may be found when examining gender as a moderator of the connections found in the present study. Additionally, considering substance use generally increases as adolescents progress throughout high school (National Institute on Drug Abuse, 2020), future studies should examine if grade level impacts the role of emotion dysregulation on alcohol use and problems. Almost half (48.1%) of the current sample were high school freshmen, so future studies examining higher grade levels with greater alcohol consumptions patterns may exhibit different findings.

Lastly, cannabis use is also highly prevalent among high schoolers, with 43.7% of 12th graders having reported cannabis use and 27.9% having reported vaping with cannabis (National Institute on Drug Abuse, 2020). Given this high usage, future studies should include cannabis in substance use analyses. Furthermore, studies should also examine the co-use of cannabis and alcohol because although co-use is increasingly common, research understanding concurrent and simultaneous use is lacking. Examining

these behaviors in relation to emotion dysregulation may further identify risk factors and motivators of adolescent substance use and improve substance use outcomes.

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Table 1. Means, standard deviations, and coefficient alphas of variables at Time 1 and Time 2

Variable	M	SD	α
T1 DERS Total	82.72	26.78	.95
T1 Nonacceptance	12.22	6.33	.91
T1 Goals	13.18	5.54	.88
T1 Impulse	11.34	5.08	.83
T1 Awareness	17.97	5.53	.82
T1 Strategies	16.34	7.78	.91
T1 Clarity	11.73	4.38	.79
T1 AUDIT Total	0.95	2.52	.81
T2 DERS Total	88.50	25.38	.94
T2 Nonacceptance	13.27	6.08	.88
T2 Goals	14.19	5.30	.86
T2 Impulse	11.55	4.78	.81
T2 Awareness	18.43	5.57	.83
T2 Strategies	18.11	7.83	.88
T2 Clarity	12.96	4.59	.81
T2 AUDIT Total	1.05	2.85	.71

Note. T1 = Time 1, T2 = Time 2

Table 2. Correlations between DERS total, subscales, and AUDIT Time 1 and Time 2 variables

	3	4	5	6	7	8	9	10	11	12	13	14	15	16
-														
.58**	-													
.18**	.26**	-												
.72**	.68**	.31**	-											
.51**	.51**	.48**	.66**	-										
.19**	.23**	.08*	.22**	.18**	-									
.56**	.56**	.34**	.63**	.50**	.15*	-								
.38**	.40**	.09	.50**	.32**	.06	.77**	-							
.58**	.45**	.12*	.50**	.36**	.10	.76**	.54**	-						
.37**	.54**	.18**	.41**	.28**	.04	.74**	.53**	.50**	-					
.23**	.28**	.61**	.26**	.32**	.32**	.13*	.48**	.10	.15*	.22**	-			
.50**	.43**	.22**	.61**	.41**	.13*	.13*	.90**	.69**	.67**	.63**	.30**	-		
.44**	.39**	.32**	.48**	.55**	.19**	.19**	.75**	.48**	.47**	.44**	.43**	.57**	-	
.00	.07	.20**	.03	.10	.37**	.20**	.20**	.18**	.10	.20**	.03	.21**	.17**	-

Variable	1	2
1. T1 DERS Total	-	
2. T1 Nonacceptance	.81**	-
3. T1 Goals	.79**	.60**
4. T1 Impulse	.78**	.57**
5. T1 Awareness	.50**	.18**
6. T1 Strategies	.92**	.75**
7. T1 Clarity	.78**	.53**
8. T1 AUDIT Total	.24**	.19**
9. T2 DERS Total	.69**	.55**
10. T2 Nonacceptance	.52**	.59**
11. T2 Goals	.53**	.40**
12. T2 Impulse	.47**	.36**
13. T2 Awareness	.39**	.17**
14. T2 Strategies	.60**	.48**
15. T2 Clarity	.56**	.41**
16. T2 AUDIT Total	.07	-.02

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

Table 3. Negative binomial regression results for baseline AUDIT total and baseline DERS total model

Predictor Variable	<i>n</i>	B	<i>SE</i>	CI
Baseline AUDIT Total	672			
Baseline DERS Total***	672	.023	.004	[.014, .031]
<i>Df</i>		1		

Note. CI = confidence interval

p* < .05. *p* < .01. ****p* < .001

Table 4. Negative binomial regression results for T2 AUDIT total and baseline DERS total model

Predictor Variable	<i>n</i>	B	<i>SE</i>	CI
T2 AUDIT Total	291			
Baseline DERS Total	291	.001	.006	[-.011, .012]
Baseline AUDIT Total***	291	.299	.074	[.154, .444]
<i>Df</i>		1		

Note. CI = confidence interval

p* < .05. *p* < .01. ****p* < .001

Table 5. Negative binomial regression results for baseline AUDIT total and baseline DERS subscales model

Predictor Variable	<i>n</i>	B	<i>SE</i>	CI
Baseline AUDIT Total	670			
Nonacceptance	670	.009	.028	[-.047, .064]
Goals	670	.043	.029	[-.014, .100]
Impulse*	670	.064	.031	[.004, .125]
Awareness	670	.007	.023	[-.038, .051]
Strategies	670	.000	.028	[-.056, .055]
Clarity	670	.033	.039	[.109, .720]
<i>Df</i>		1		

Note. CI = confidence interval

p* < .05. *p* < .01. ****p* < .001

Table 6. Negative binomial regression results for T2 AUDIT total and baseline DERS subscales model

Predictor Variable	<i>n</i>	B	<i>SE</i>	CI
T2 AUDIT Total	290			
Nonacceptance	290	-.023	.034	[-.089, .043]
Goals	290	-.018	.039	[-.094, .059]
Impulse	290	-.018	.042	[-.100, .064]
Awareness**	290	.079	.028	[.024, .134]
Strategies	290	.012	.036	[-.058, .083]
Clarity	290	.020	.042	[-.062, .102]
Baseline AUDIT Total***	290	.293	.070	[.156, .430]
<i>Df</i>		1		

Note. CI = confidence interval

p* < .05. *p* < .01. ****p* < .001