

Negative Affect and Performance on Exam Day in College Students: The Role of Self-Regulation

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Abstract

In the U.S., college transition grows increasingly difficult, with students experiencing rising levels of stress and anxiety. Such challenges may arise as students face normative but novice stressors while working towards professional goals. Students' ability to engage in successful self-regulation may be especially important in response to these challenges. The goals of the present study were to assess a) the mediating role of self-regulatory behaviors on the relationship between trait emotion regulation and negative affect (NA) on the day of a first major college exam; and b) the mediating role of exam-day NA on the relationship between self-regulatory behaviors and exam performance. Results show that trait-level challenges in emotion regulation are associated with increased procrastination behaviors in the days before the exam, which in turn is associated with higher NA on exam day. Implications are discussed for well-being and success of students, particularly for students who struggle with self-regulation.

Keywords: Self-regulation; emotion regulation; academic stress; time management; emerging adulthood.

Introduction

The transition to college is an important but challenging developmental experience as emerging adults adjust to new stressors and increased autonomy. Research suggests that this transition has only grown increasingly difficult in recent years, as individuals adjust to independent decision-making in a new and stressful environment. Thus, the ability of a given individual to engage in successful self-regulation may be more important than ever. However, it is currently unclear how trait-level self-regulatory difficulties promote daily behavioral regulation challenges during this challenging developmental time, and in turn, how such behavioral choices affect well-being and successful goal achievement in the face of stressors. In the present study, we investigated the mediating role of time-management related self-regulatory behaviors on the relationship between trait emotion self-regulation and negative affect (NA) on the day of a first major college/higher education exam. Additionally, we assessed the mediating role of NA itself on the relationship between self-regulatory behaviors and actual performance on this first major exam. Results evaluate the potential mechanisms by which self-regulation can promote improved emotional and performance outcomes for normative stressors during the college years.

Emerging Adulthood and the Transition to College

The period between ages 18 and 25 has been increasingly considered as a stage of development that is distinct from both adolescence and young adulthood, a stage composed of "emerging adults" (Arnett, 2000). As emerging adults, individuals reside in a separate developmental space, and face unique challenges, goals, and experiences. According to Arnett (2000), individuals in the emerging adulthood stage explore and pursue various cohort-specific goals, such as experimenting with romantic partnerships, career paths and world views. Emerging adults begin to acquire new duties and roles, and increasingly



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acquire greater independence from parental figures. At the same time, however, emerging adults do not yet consider themselves to be full adults, and in fact, do not typically face all of the responsibilities of adulthood, often still relying on financial, decision-making or logistical support from parental figures. This is particularly the case for college students in industrialized nations (Arnett, 2000), where education and training delay the process of entering into adulthood, but also encourage the push out of adolescence.

The developmental transition to college, although important, can be challenging. College students are being exposed to new levels and types of stressors, while simultaneously needing to learn autonomous adult skills. For example, they must adjust to moving to a new environment, living with strangers and trying to build new social connections, navigating a completely new academic environment with all its accompanying demands, juggling the financial obligations entailed in higher education, and striving towards ever-looming professional goals. They do all of this with less parental oversight and direct assistance, but persistent parental pressure and expectations (Agliata & Renk, 2008). It is no wonder that students broadly endorse a variety of stressors including academic, interpersonal and environmental (Larson, 2006; Ross et al., 1999). Managing these variable and important stressors is a daily challenge, and in fact college students endorse daily hassles as the major source of their stress, above and beyond major life events (Ross et al., 1999).

The college transition is thus clearly a demanding time in development. In recent years, the transition has grown increasingly challenging, with college students reporting a more difficult time emotionally adjusting to this transitional period. According to a Higher Education Research Institute report, first-year college students in recent years have exhibited a decline in emotional well-being and an increase in feelings of being overwhelmed (Eagan et al., 2016), with this being especially true of female first-years. This is further reflected by the 30 to 40% increase in the utilization of counseling center services over a five-year period from 2010 to 2015, and by a continuing rise in feelings of anxiety and depression (Center for Collegiate Mental Health, 2018). Understanding factors that can promote a healthy transition to a normatively demanding time is becoming of more urgent importance.

As discussed, this transitional period is a time in which emerging adults are gradually acquiring independent qualities and abilities such as financial independence, independent decision-making, and self-directed time management (Arnett, 2000). Rather than relying on authority figures to manage their lives, emerging adults must learn to regulate themselves as they strive towards their important life goals. Such self-control may then be instrumental in fostering a healthy response to the challenge inherent in developing independent skills, helping emerging adults to feel competent in taking on new roles, facilitating their ability to adjust emotionally and practically to the variable stress they experience. Thus, self-regulatory skills may be an important tool in offsetting the rising emotional maladjustment and promoting successful goal achievement during the college years.

Self-Regulation in College Students

Self-regulation involves the self-management of several factors, including emotions, thoughts, and behaviors (Muraven & Baumeister, 2000). The literature on stress and coping has identified two self-regulation strategies: problem-focused strategies that emphasize regulating one's behaviors to solve a problem, or emotion-focused strategies that emphasize regulating one's thoughts or emotions (Lazarus, et al., 1980).

Although traditionally considered distinct approaches to dealing with stress, problem-focused and emotion-focused approaches may both be important during college. College students, and emerging adults broadly, must increasingly learn to manage themselves both emotionally and behaviorally; growth in both of these areas is important in facilitating a healthy adjustment to the new trials of college life. For example, college students' use of problem-solving self-regulatory strategies has been associated with better health (Sasaki & Yamasaki, 2007), reduced negative affect (Helzer & Jayawickreme, 2015; Wrosch et al., 2000), and less volatile daily negative affect (Russell & Anderson, 2018). Likewise, emotion regulation has been associated with reduced depression, anxiety and stress in the first year of college (Park et al., 2012). Importantly, recent research suggests that college students use proportionally more emotion-focused strategies than problem-focused strategies (Brougham et al., 2009). The extent to which self-regulation, both emotionally and behaviorally, influence both each other and the response to stress is still not well-understood, but may provide important insight into skills that can promote a healthy college adjustment.

Consider, for example, a typical college student facing a major exam, a normative and recurring college stressor. They cannot make the exam disappear, and is likely to be managing that exam with several other major assignments, various conflicts and engagements with friends or partners, and part-time or full-time employment. According to self-regulation theory, individuals possess a limited capacity for self-regulation; when an individual expends the energy needed to exert self-control, it depletes the amount available for future self-regulation (Muraven & Baumeister, 2000). The normative college juggling act of stressors may impair a student's ability to self-regulate, by demanding overwhelming self-control resources. This is further supported by evidence that students' ability to self-regulate both cognitively and behaviorally is poorer among students during an examination period as compared to those not in such a period (Oaten & Cheng, 2005).

Despite the difficulty inherent in such self-control, the preservation of and growth in self-regulatory function is nevertheless especially important in the college years. Individuals' ability to self-regulate can help them persist with goal-motivated behaviors (e.g. managing enough study time) even when they feel stressed. Such behaviors make them more prepared for their stressors (e.g. a major exam or paper), which can then in turn reduce their feelings of negative affect in the midst of the stressors. The ability to successfully self-regulate may be especially advantageous in such a normatively stressful environment. Indeed, failures of behavioral self-regulation, particularly with regard to procrastination, have been clearly linked to poorer academic performance (e.g., Steel et al., 2001). This performance deficit may result from both poorer preparation as a result of behavioral self-regulation failure, as well as the negative mood that such self-regulatory failure can elicit. Theory suggests that negative mood pulls attentional resources away from the demands of a task, resulting in limited attentional resources available for the task itself (Beal et al., 2005). In support of this, NA has been empirically linked with poorer performance in college students (e.g., Barrows, et al., 2013; Koy & Yeo, 2008).

Considering these different aspects collectively, it may be that students with poorer emotion regulation exhibit poorer behavioral regulation in advance of an exam, which in turn leads to greater NA and poorer performance on the exam day. In the present study, we investigated the mediating role of time-management-related self-regulatory behaviors on the relationship between trait emotion regulation and NA on the day of a first major exam in a sample of college students. Subsequently, the extent to which NA itself mediates the relationship between self-regulatory behaviors and actual performance on this first major exam was explored. Students were asked about their NA minutes before the exam was given, to encourage authentic self-reporting. Similarly, rather than asking students about their general time management skills or behaviors, students were asked (on exam day) about their time management behaviors in the days immediately preceding the exam, to focus their self-report and to limit recall error. Exam scores were provided (anonymously) by professors for objectivity.

In line with prior research showing that goal perseverance is associated with better affect regulation in college (Helzer & Jayawickreme, 2015; Russell & Anderson, 2018), it was predicted that behavioral self-regulatory challenges would mediate the relationship between emotion regulation and NA on exam day, such that emotion regulation challenges would lead to poorer behavioral self-regulation which in turn would lead to greater NA on exam day. Given the literature that negative mood may impair performance (Beal et al., 2005; Koy & Yeo, 2008), we predicted that NA would in turn mediate the relationship between self-regulatory behaviors and scores on the exam, with elevated NA linked with poorer exam performance.

Method

Approval for the present study was granted in advance of participant recruitment by the Institutional Review Board. Participants included college females from across four sections of Introductory Psychology at an all-female small liberal arts college in the Midwestern United States. Students interested and willing to participate signed informed consent documents prior to data collection. In total, 47 participants consented and completed all measures, and were included in the present study. Participants ranged in age from 18-22, with the majority of participants being first-year college students ($M = 18.96$). 80.9% of the sample self-identified as White/Caucasian, 12.8% as Latina/Hispanic, 2.1% as Black/African American, and 8.5% as Asian.

At the beginning of the semester, participants first completed an online survey of trait-level self-regulatory emotional challenges. Then, in-class on the day of the first exam, before the exams were distributed, participants reported their current NA. The night of this first exam, participants also completed a survey of their actual time management self-regulatory behaviors in the days leading up to the exam. Scores on the exams were calculated and provided by the four individual instructors.

Measures

Trait-Level Emotion Regulation Difficulty

Participants first completed the GOALS subscale of the Emotion Regulation Difficulties Scale (DERS) (Gratz & Roemer 2004) online at the start of the semester. The GOALS subscale includes five items that assess trait difficulties engaging goal-directed efforts when upset. Participants rate the extent to which they agree with statements such as, “When I’m upset, I have difficulty getting work done,” on a scale of 1- 5. Scores are summed across items; scores can range from 5 -25. Cronbach’s alpha for the GOALS scale in the present data was .84.

Time Management Self-Regulation Failures

The Self-regulatory Behaviors scale assesses nutrition, time management, spending, and emotion regulation failures in the past week (Job et al., 2015). In the present study, the time management items from this measure were adapted to ask about only the prior three days leading up to the exam. This time management subscale includes ten items that ask participants to rate how frequently they engaged in the presented behaviors, with answers ranging from 0 (never) to 5 (7 or more times). Sample items include, “How often did you postpone starting studying, even if it would have been important to start?” and, “How often did you have to change your plans because you weren’t organized enough?”. In the present study, participants responded to these questions online the day of the first exam and were instructed to consider their behavior over the preceding few days leading up to the exam. For the present study, scores were summed; scores can range from 0 to 50. Cronbach’s alpha for the scale in the present study was .87.

Negative Affect Before Exam

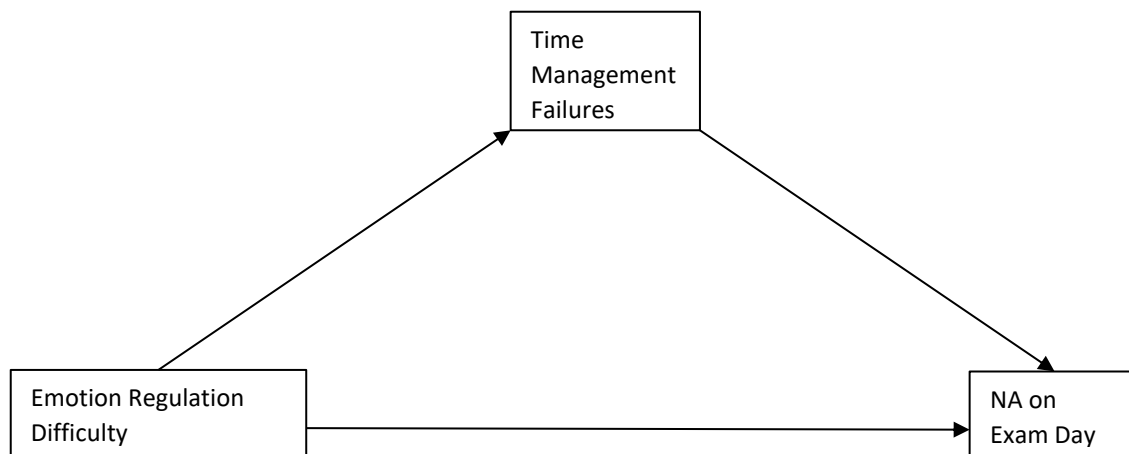
Current negative affect was assessed using the Negative Affect (NA) scale of the Positive and Negative Affect Scale (PANAS; Watson, et al.,1988); respondents reported their current feeling of 10 negative emotions, for example “irritable” and “distressed” on a 5-point Likert scale ranging from 1 (not at all) to 5 (extremely). Participants in the present study completed this survey in-class on the day of the first exam, prior to exam distribution. Scores were summed. Scores range from 10 to 50, with higher values indicating higher levels of NA. Cronbach’s alpha for the NA scale was .81 for the present sample.

Exam Scores

Instructors from each section submitted scores for each participating student by providing test scores for each student via anonymous ID number. Although each instructor gave and graded their own exam, scores were converted to percentage points (100 total) for the first exam, for consistency across sections. Because different sections and instructors may vary somewhat in material covered, exam structure, and exam difficulty, “instructor” was used as a control in relevant analyses, as will be discussed in subsequent sections.

Analyses

Following preliminary descriptive statistics and correlations, two models were tested using bootstrapping mediation analyses (PROCESS) (Hayes, 2018). As shown in Figure 1, in the first model, we assessed the mediating role of time management behavioral failures on the relationship between trait emotion self-regulation and NA on the day of a first major exam.

Figure 1*Simple Mediation Model for NA on Exam Day*

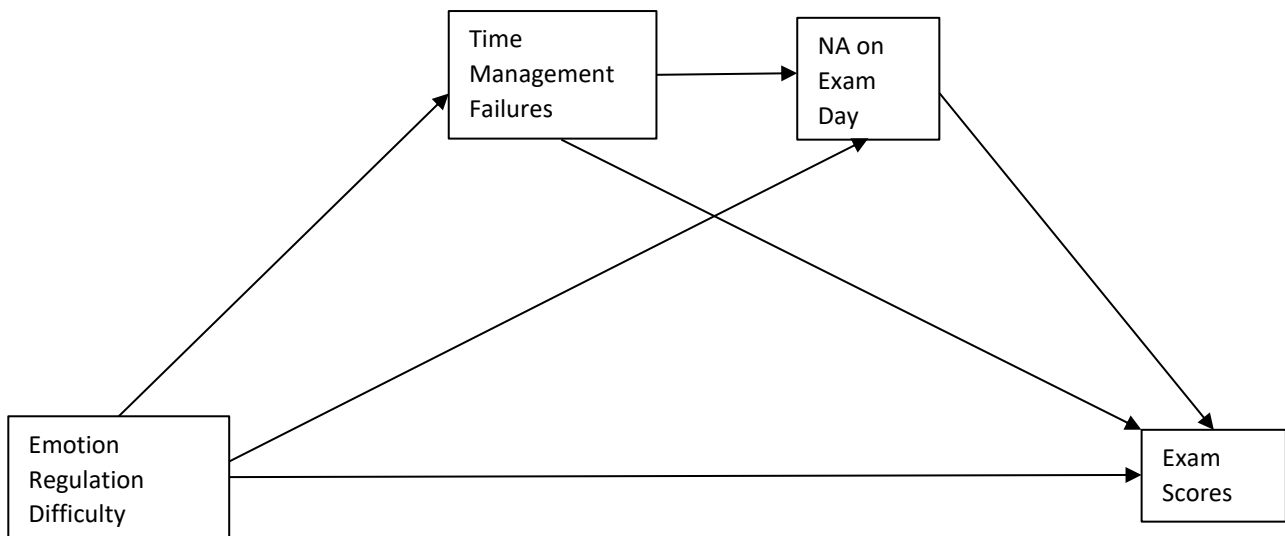
Note. Proposed mediation of time management behavioral failures on the relationship between trait emotion self-regulation and NA on the day of a first major exam.

Following this initial analysis, as shown in Figure 2, we assessed a serial two-mediator model in which emotion regulation difficulty leads to time management failures. This failure leads to greater NA on exam day, which in turn leads to poorer exam performance. Of particular interest in the second model was the mediating role of (1) time management behaviors and (2) NA on the relationship between emotion regulation and scores on Exam 1 (controlling for instructor/section). A serial model was chosen to allow for the proposed relationship between the two mediators. In parallel multiple mediation models, the assumption that there is no causal relationship between mediators must be met. In serial multiple mediator models, this assumption is not present; rather, a causal relationship is explicitly included in the model (Hayes, 2018).

The temporal order of the variables should be further explained. Assessed variables include trait emotion regulation (measured at the beginning of the semester), self-regulatory behaviors in the days preceding the exam, and NA and performance on the day of the exam. This is consistent with the predictions of the mediation. It should be made clear, however, that with regard to the self-regulatory behavior survey, although participants were asked to report on their behavior in the days preceding the exam, they actually took this survey after the exam was over, that evening. This timing was chosen (rather than on the night or morning prior to the exam) to promote student recall of the most immediate days prior to the exam, without adding to potential exam-day negative affect (by asking student to reflect on their time management failures), and without potentially changing the behaviors themselves (due to the self-reflection needed to answer the question). Thus, we believe that appropriate temporal ordering of variables is intact due to the instructions provided on the chosen variables, with participants reporting on the days prior to the exam.

Figure 2

Multiple Mediator Model for Exam Scores



Note. Proposed two-mediator model on the mediating role of (1) time management behaviors and (2) NA on the relationship between emotion regulation and scores on Exam 1.

Results

Descriptive statistics and correlations between variables used in the present study are presented in Table 1.

Table 1

Means, Standard Deviations, and Correlations

	Mean	SD	1	2	3	4
1 Emotion Regulation Difficulties	15.72	4.58	--	--	--	--
2 Time Management Failures	9.90	7.10	.32*	--	--	--
3 NA on Exam Day	19.2	5.76	.28*	.36*	--	--
4 Exam Scores	77.76	18.0	-.04	-.06	-.25*	--

Note. NA = negative affect. SD = standard deviation. * = $p < .05$

Positive associations were found between trait-level emotion regulation difficulty and time management behavioral failures ($B = .32, p = .02$), between trait-level emotion regulation difficulty and NA on exam day ($B = .28, p = .03$), and between time management behavioral failures and NA ($B = .36, p = .01$). A significant negative association was found between NA and exam scores ($B = -.25, p = .04$). Because different sections and instructors may vary in material covered, exam structure, and exam difficulty, we additionally assessed whether instructor (section) was a significant predictor of exam scores. Indeed,

instructor/section was significantly associated with exam scores ($F = 5.43, p = .002$), and thus was used as a covariate in the model predicting exam scores.

Consistent with the current analytical literature, bootstrapping mediational analyses were used in the present study. The use of bootstrapping was employed to avoid the pitfalls inherent in the causal steps strategy by focusing on the quantitative effect of the indirect effect to establish mediation (see Hayes, 2018 for discussion).

In the first analysis, we predicted that self-regulatory behavioral failure would mediate the relationship between trait-level emotion regulation and NA on the first exam day. Results are displayed in Table 2 and Figure 3. Emotion regulation difficulty was positively associated with time management failures in the days leading up to the first exam ($B = .66, CI [.16, 1.16]$). Time management failures were positively associated with NA on exam day ($B = .26, CI [.02, .50]$). The total effect of emotion regulation difficulty on NA was not significant ($B = .31, CI [-.11, .74]$). The direct effect of emotion regulation difficulty was not significantly associated with NA on exam day ($B = .14, CI [-.29, .58]$). Importantly, a significant direct effect is not a necessary prerequisite for mediation; mediation can be inferred by a significant indirect effect in the absence of a significant direct effect (Hayes, 2018). In line with this, there was a significant indirect effect of emotion regulation difficulties on exam-day NA through time management failures in the days before the exam, ($B=.17, CI [.003, .42]$).

Table 2

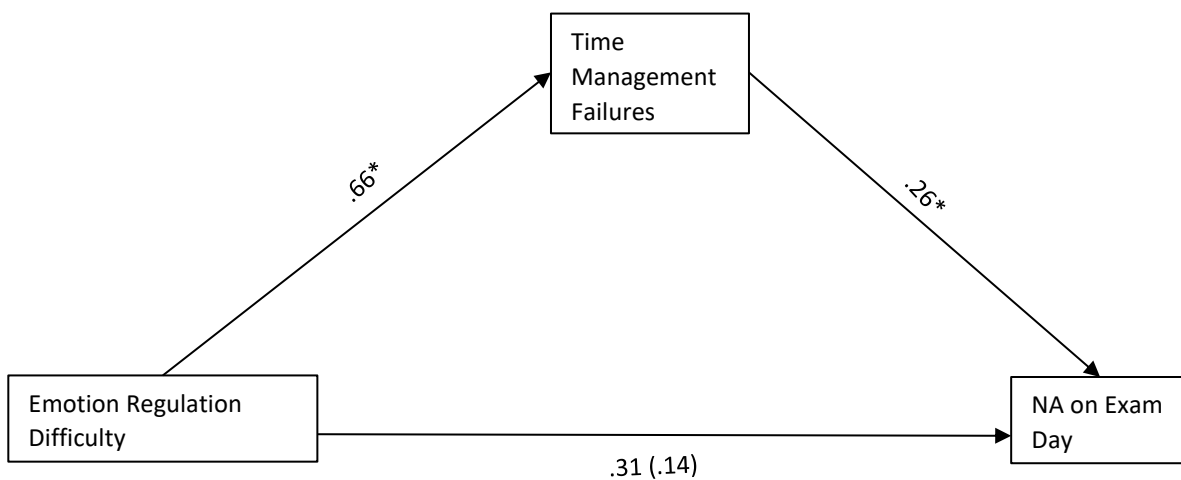
Mediation Model for NA on Exam Day

Predictor	Outcome					
	<i>M</i> (Time Management Failures)			<i>Y</i> (NA on Exam Day)		
	<i>Coeff.</i>	<i>SE</i>	<i>p</i>	<i>Coeff.</i>	<i>SE</i>	<i>p</i>
X (Emo. Regulation. Difficulty)	.66	.25	.01	.14	.22	.51
<i>M</i> (Time Management Failures)	--	--	--	.26	.12	.04
Constant	-.48	3.97	.91	14.11	3.19	<.001
	$R^2 = .13$ $F(1,45) = 6.96, p = .01$			$R^2 = .14$ $F(2, 44) = 3.56, p = .04$		

Note. NA = negative affect.

Figure 3

Results of Mediation Model for NA on Exam Day



Note. NA = negative affect. * = $p < .05$

In the second mediational model, we built off of the initial model by assessing NA as a second serial mediator between time management behaviors and scores on the first exam, and additionally as a mediator between trait-level emotion regulation difficulty and exam scores. Section/Instructor was included as a covariate. Results are summarized in Table 3 and Figure 4. Emotion regulation difficulty was positively associated with time management failures in the days leading up to the first exam ($B = .68$, CI [.15, 1.21]). Emotion regulation difficulty was not significantly associated with NA on exam day ($B = .17$, CI [-.29, .63]). Time management failures were positively and significantly associated with NA on exam day ($B = .25$, CI [.001, .50]). Neither emotion regulation difficulty ($B = .58$, CI [-.88, 2.03]) nor time management failures ($B = .14$, CI [-.69, .96]) were significantly associated with exam scores. The relationship between NA and exam scores trended towards, but did not meet, statistical significance ($B = -.88$, CI [-1.86, .11]). The indirect effect from emotion regulation difficulty to exam scores through time management failures was not significant, ($B = .09$, CI [-.45, .91]), nor was the indirect effect from emotion regulation difficulty to exam scores through NA ($B = -.15$, CI [-.71, .53]). The indirect effect from emotion regulation difficulties to exam scores through both time management failures and NA trended towards but did not meet statistical significance ($ab = -.15$, CI [-.81, .01]).

Table 3

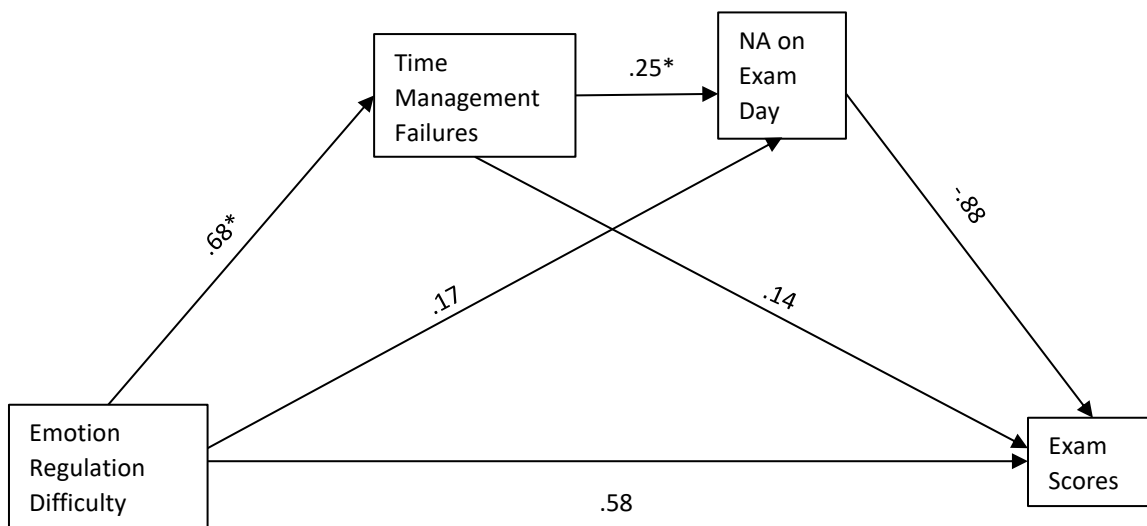
Serial Mediation Model for Exam Scores

Predictor	M_1 (Time Management Failures)			Outcome M_2 (NA)			Y (Exam Scores)		
	Coeff.	SE	p	Coeff.	SE	p	Coeff.	SE	p
X (Emo. Regulation Difficulty)	.68	.26	.01	.17	.23	.47	.58	.72	.43
M_1 (Time Management Failures)	--	--	--	.25	.12	.049	.14	.41	.74
M_2 (NA)	--	--	--	--	--	--	-.88	.49	.08
Constant	-.47	3.97	.91	13.19	4.09	.003	91.82	14.33	<.001
	$R^2 = .14$ $F(2,42) = 3.44, p = .04$			$R^2 = .14$ $F(3,41) = 2.22, p = .10$			$R^2 = .10$ $F(4,40) = 1.15, p = .35$		

Note. NA = negative affect.

Figure 4

Results of Serial Mediator Model for Exam Scores



Note. NA = negative affect. * = $p < .05$. This model controls for instructor/section.

Discussion

The transition to college is difficult, and in recent times, emerging adults have increasingly struggled to emotionally adjust. Management of academic demands account for much of the stress college students experience (Beiter et al., 2015), and recent college students appear to be experiencing greater affective and psychological challenges in coping with these normative stressors (Center for Collegiate Mental Health, 2018). Because the transition involves greater independence and reduced parental oversight, an emerging adult's ability to self-regulate may help offset the challenges inherent in the transition, promoting better emotional adjustment and goal achievement. In the present study, we explored the mechanisms by which self-regulation, including both trait-level emotion regulation and day-to-day behavioral regulation, relate to the emotional response to and performance on a college exam.

Results of the present analyses provide support for the mediating role of daily time-management-related self-regulatory behaviors on the relationship between trait emotion self-regulation and NA during a first major exam. In other words, individuals who possess greater ability to control their emotions when upset are more likely to engage in better time management in the days leading up to an exam, which is in turn associated with reduced NA on exam day. When under stress, individuals with greater emotion regulation may be more successful at regulating their time and academic behaviors despite the pressure they may experience. This successful self-management may in turn reduce the negative feelings that can accompany exam-taking. Future studies can investigate how to promote self-regulation (either emotion regulation or behavioral regulation) and also assess the utility of self-regulation education or training for reducing negative affect during normative academic stressors. Considering the rising levels of emotional challenges college students experience, future work should also investigate whether reducing the negative affect associated with academic stressors is beneficial for promoting greater student mental health more broadly.

Promotion of not only emotional well-being, but also practical success, is critical, as college students must also be able to perform successfully on their various tasks in order to meet their achievement-related goals. Present results indicate that time management behaviors were not significantly associated with exam scores (either directly or as a mediator between emotion regulation and exam scores). In the present study, self-regulatory behaviors assessed focused on time management behaviors, including organization and commitment to studying. It may be that these behaviors alone are not enough to lead to better exam performance. Self-regulation of learning includes aspects of time management and goal commitment, but also encompasses self-selection of appropriate learning strategies, monitoring and evaluating academic success, and maintaining attention (Zimmerman, 2000). Future studies should evaluate which components of self-regulation are important to foster not only a better affective response to academic stressors, but also stronger academic performance.

In the present study, the relationship between NA and exam scores was not significant, nor was the mediational relationship from emotion regulation difficulties to exam scores through time management and NA. Prior research has provided some evidence that negative mood impairs performance in college students (Barrows et al., 2013; Koy & Yeo, 2005); nevertheless, there is additional evidence for a more nuanced relationship, whereby NA impairs performance in some individuals but strengthens it in others, or where different types of negative mood are more harmful than others (Catanzaro, 1996; Lane et al., 2005). Further investigation is needed to clarify the relationship between NA and performance amongst college students, particularly for normative stressors like examinations.

There are a few limitations of the present study that should be noted. The sample included in the present study was relatively small, which may have limited power to assess proposed effects. Despite these challenges, observed results support the role of self-regulation in reducing the negative affect students experience when facing an exam, and thus highlight the need for ongoing investigation and attention to these areas. Additionally, the sample included all females attending the same women's college. College females in particular are at greater risk for affective distress in the college years (e.g., Eagan et al., 2016), and more females than males rate academic stressors as an extremely significant source of stress (Beiter et al., 2015). Thus, investigation into the affective response to an academic stressor in this high-risk group was considered important and justifies the focus of the present study. Nevertheless, the generalizability of the current findings should be explored in future studies by assessing more diverse samples, including males and students attending a wide range of academic institutions. Similarly, investigation of the relationships assessed in the present study should be studied in non-college-going populations of emerging adults, as well as for non-academic stressors. Such studies will provide insight into the extent to which the role of self-regulation broadly, as well as the type of self-regulation, is more or less useful in different contexts among emerging adults.

Methodologically, as described previously, although participants were asked to report on their self-regulatory behaviors in the days preceding the exam, they actually took this survey after the exam was over, that evening. This timing was intentionally chosen to promote authentic student recall of the most immediate days prior to the exam without influencing participant mood or behavior. Nevertheless, future replications that use alternative survey designs will be valuable. Future studies may also assess variability, or within-person change in these relationships, for example, by comparing students' performance when higher in NA to their own performance at other times when they experience lower NA relative to their own average.

Conclusion

Prior studies have shown that self-regulatory difficulties are associated with higher levels of anxiety and distress particularly during the transition to college. Results of the present study add to this research by demonstrating that trait-level challenges in self-regulation are associated with increased procrastination behaviors in the period leading up to an exam, which in turn is associated with higher NA on exam day. Such findings have important implications for the well-being and success of college students, and point to potential interventions that target self-regulatory challenges. Future work should particularly investigate interventions with students with lower trait self-regulatory abilities and/or greater behavior regulation failures, and explore the extent to which interventions designed to improve self-regulation promote a better affective response, as well as higher achievement, in the face of normative college stressors.

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