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The influence of emotional intelligence, cognitive test anxiety, and coping strategies on undergraduate academic performance

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ABSTRACT

This study explored factors with the potential to exert facilitative and debilitative influence on undergraduate students' academic performance. Participants responded to the Schutte Emotional Intelligence Scale, COPE inventory, and Cognitive Test Anxiety Scale-Revised and agreed to have their responses paired with institutional performance data. Analyses tested the iterative and collective influence of the identified variables on four-year GPA after controlling for previous academic performance (first-year GPA). The examination revealed cognitive test anxiety and use of emotion-focused coping strategies were significant predictors of students' long-term academic outcomes such that increased cognitive test anxiety and increased use of emotion-focused coping strategies were associated with decreases in four-year GPA. The results inform the nature of the influence these student factors have on long-term academic outcomes and highlight the importance of developing a multifaceted intervention model that supports emotion regulation and self-regulation skill development to buffer the impact of cognitive test anxiety on achievement.

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1. Introduction

It is well established in the psychological literature that standard cognitive processing differences are insufficient to capture the full range of variability observed in academic performance (e.g., Duckworth, Peterson, Matthews, & Kelly, 2007; Schunk & Zimmerman, 2003; Snow, Corno, & Jackson, 1996). The classic approach to this work has primarily adopted a deficit orientation and has focused on identifying constructs that exert a debilitative influence on performance. For instance, it has been effectively summarized that student performance can be adversely impacted by stressors within (e.g., task difficulty, academic overload, academic anxiety) and beyond the academic setting (e.g., financial obligations, family, and personal needs). Alternatively, many contemporary conceptual orientations have adopted a positive psychology perspective concerned with the identification of facilitative influences of affective constructs such as grit (Duckworth et al., 2007), a sense of purpose (Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008), and emotional intelligence (Perera & Digiacomo, 2013). We advocate for a broader perspective when examining students' academic abilities and self-regulatory tendencies that acknowledge both the adaptive and maladaptive influences of constructs in the affective domain. While information related to both supportive and debilitative influences on student performance hold value in isolation, it is only with attention to multiple factors in concert that the true operations of the factors may be realized. Therefore, the purpose of the current examination was to explore the viability of a theoretically based framework for explaining the influences of supportive and debilitative factors on undergraduate students' GPAs over the typical four-year time interval.

1.1. Emotional intelligence

Emotional intelligence (EI) is an expansive construct consisting of mental skills, abilities, and capacities that both process and draw from emotions (Salovey & Mayer, 1990; Mayer, Salovey, & Caruso, 2000). Dominant theoretical orientations assume these tendencies allow individuals to accurately assess, regulate, and express their emotional states as well as to perceive and assess the emotional states of others (Ciarrochi et al., 2001; Mayer & Salovey, 1997). Further, EI appears to be a multidimensional construct characterized by bidirectional influences among familial, environmental, and cognitive factors. Moreover, as such, EI has the potential to influence the expression, interpretation, and impact of emotional responses in all phases of human experience (Mayer, Roberts, & Barsade, 2008).

Over the past 20 years, the field has clarified a distinction between two common constructs found within EI literature, commonly referred to as trait and ability EI. Trait EI can be conceptualized as individuals' perceptions of their emotional world and emotional self-efficacy

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(Petrides et al., 2016; Petrides & Furnham, 2000). That is, trait EI refers to perceptions of the behavioral dispositions and abilities that allow individuals to effectively assess, regulate, and express emotional states (Petrides & Furnham, 2000). Given the subjective nature of the construct, trait EI is commonly assessed within empirical investigations via self-report measures (Mavroveli, Petrides, Rieffe, & Bakker, 2007). Conversely, ability EI is conceptualized as the actual cognitive abilities that allow individuals to identify, understand, and manage emotions (Bar-On, 2010; Mavroveli et al., 2007). Consequently, research examining ability EI have commonly assessed the construct using performance-based assessments (Petrides, Pita, & Kokkinaki, 2007). While these constructs differ in their operationalization, both have shown strong predictive utility in regards to numerous academic, career, and life outcomes (Petrides et al., 2016; Amdurer, Boyatzis, Saatcioglu, Smith, & Taylor, 2014).

Negative associations between EI and various psychological traits (e.g., anxiety, depression) are generally explained by the rather simple premise that one or more emotional processing dimensions (e.g., perception/clarity, management/regulation) are flawed. That is, individuals experience negative psychological states – in part – because they ineffectively interpret emotional stimuli, set inappropriate goals, implement ineffective coping strategies, or fail to employ appropriate emotion regulation skills (e.g., Salovey et al., 2008; Yusoff et al., 2013). For instance, prior studies have demonstrated that individuals with anxiety have difficulty engaging in strategies that will help them manage or change their emotional states due to low emotional clarity, inability to process emotions, and deficient emotional regulation (Fisher et al., 2010; Fernández-Berrocal, Alcaide, Extremera & Pizarro, 2006, Southam-Gerow & Kendall, 2000). Perhaps paradoxically, empirical investigations have also indicated that high levels of specific dimensions of EI may backfire and heighten individuals' risk for negative affective outcomes. As explained by Ciarrochi et al. (2001), individuals with high levels of emotional perception may become more aware of environmental stressors and sources of struggle in their lives, contributing to higher levels of perceived stress.

Investigations stemming from a positive psychology perspective have highlighted the facilitative influence of EI within academic settings. For instance, researchers that have modeled "thriving" with respect to trait and ability EI have demonstrated that students' levels of EI are positively associated with numerous adaptive outcomes including: psychological wellbeing (Salami, 2011), quality of interpersonal relationships (Afolabi, Okediji and Ogunmwonyi, 2009), conflict resolution skills (Salovey, Mayer, Caruso, & Yoo, 2008), year retention at the university level (Parker, Hogan, Eastabrook, Oke, & Wood, 2006; Qualter, Whiteley, Morley, & Dudiak, 2009), and academic achievement (e.g., standardized test scores, grade point average, graduation; Fernández, Salamonson, & Griffiths, 2012; Hogan et al., 2010; Jaeger & Eagan, 2007; Keefer, Parker, & Wood, 2012; MacCann et al., 2011; Mayer et al., 2008; Mestre, Guil, Lopes, Salovey, & Gil-Olarte, 2006; Perera & Digiacomo, 2013).The facilitative influence of EI within academic domains has traditionally been attributed to students' abilities to "successfully navigate" the complex social-emotional environment imposed by academic environments (Matthews, Zeidner, & Roberts, 2002). More specifically, EI has been linked to psychological constructs that are believed to directly or indirectly contribute to academic success — such as need for achievement (Afolabi et al., 2009), adaptive coping strategies (MacCann et al., 2011; Tugade & Frederickson, 2008), and positive peer interactions (Mavroveli, Petrides, Rieffe, & Bakker, 2010; Petrides et al., 2008).

1.2. Test anxiety

Test anxiety is a pervasive form of academic anxiety that generally has a negative impact on patterns of beliefs and behaviors common to testing situations (Cassady, 2010). Traditionally, test anxiety has been conceptualized as a multidimensional construct consisting of two broad dimensions, commonly referred to as worry and emotionality (Liebert & Morris, 1967). Emotionality – or affective test anxiety – is characterized by the physiological reactions to evaluative situations that are consistent with more "traditional" anxiety responses (e.g., headaches, dry mouth). Worry – or cognitive test anxiety – includes beliefs and behaviors associated with evaluation events that impair optimal performance (e.g., avoidance, poor study skills, cognitive interference; Zeidner & Matthews, 2005).

Research in the domain of test anxiety has repeatedly linked the experience of cognitive test anxiety to performance outcomes in academic settings, with consistent findings illustrating a negative impact on student performance for high stakes tests (Cruz, 2010; DeCaro, Thomas, Albert, & Beilock, 2011; Lowe, Grubein, & Raad, 2011), typical classroom exams (Zeidner & Matthews, 2005), and even laboratory-based assessment measures that have no evaluative impact (Cassady, 2004a; Naveh-Benjamin, 1991).

Contemporary orientations have expanded upon the traditional view that test anxiety influences performance by generating cognitive interference or distraction while students are taking exams (e.g., Sarason, 1984). These updated orientations (Zeidner & Matthews, 2005; Sommer & Arendasy, 2014) propose a variety of viable explanations for "types" of test anxiety (von der Embse, Mata, Segool, & Scott, 2013), but generally support the position that test anxiety is ubiquitous operating as a trait-like anxiety. Learners encounter the influence of test anxiety across all phases of the learning-testing cycle, with investigations noting test anxiety related impairment during test preparation (Cassady, 2004b), test performance (Ramirez & Beilock, 2011), and test reflection phases (Sommer & Arendasy, 2014; Thomas & Gadbois, 2007). The synthesis of results in this domain suggests that a complete understanding of test anxiety will only be realized when researchers and clinicians recognize there are varied manifestations of the construct that are dependent upon the individual strengths and weaknesses of the learner.

Available evidence suggests that manifestations of test anxiety across the learning-testing cycle share a rather complex relationship with learners' level of EI. Fundamentally, students with high levels of skill in emotional perception and emotional regulation should be better equipped to effectively identify and respond to sources of emotional distress (Gohm et al., 2005; Sanchez-Ruiz, Pérez-González & Petrides, 2010). However, this does not mean that students with high levels of EI are necessarily predisposed to low levels of test anxiety. To the contrary, individuals with high skills in emotional perception may be more likely to identify emotional markers for stressors, increasing the overall level of perceived anxiety (Ciarrochi et al., 2001).

1.3. Coping with academic stressors

Coping strategies form a constellation of behaviors that learners employ in response to their individual-specific interpretations of external and internal threats they face in academic settings (Fletcher & Cassady, 2010). A classic and illustrative representation for the relationships among perceived stressors and coping tendencies is the Transactional Stress and Coping framework (Lazarus & Folkman, 1984). This model of coping posits that individuals' cognitive appraisals of stressors are influenced by both personal characteristics (e.g., personality characteristics, emotional intelligence, personal history) and environmental factors (e.g., academic environment, social pressures, challenging tasks; Lazarus, 1993a, 1993b; Lazarus & Folkman, 1984, 1987). Based upon this appraisal, individuals develop either a positive or negative affective emotional response to the context, establish goals for the situation, and employ coping strategies aimed at managing the perceived stressors and achieving established goals (Cassady & Boseck, 2008). Generally, coping responses can be characterized as falling within one of three broad domains: (1) active behavioral responses that aim to adapt to and manage sources of stress (i.e., problem-focused coping; Folkman & Lazarus, 1985; Zeidner & Saklofske, 1996); (2)

disengagement from the source of stress as a means of escape (i.e., avoidance-coping; Billings & Moos, 1981; Parker & Endler, 1996); and (3) adjusting one's interpretation of the situation or emotional disposition (i.e., emotion-focused coping; Austin, Saklofske, & Mastoras, 2010).

Given the dynamic nature of the coping response, it is no surprise that learners' appraisals of sources of stress and their responses to these perceptions can vary dramatically. However, empirical investigations in this domain have repeatedly demonstrated that students who employ adaptive (problem-focused) coping strategies in response to stressful academic conditions often navigate perceived challenges more effectively, attain higher levels of achievement, and report greater success overall (Dyson & Renk, 2006; McNamara, 2000; Sasaki & Yamasaki, 2007; Struthers, Perry, & Menec, 2000). By contrast, those individuals prone to employing maladaptive, emotion-focused, avoidant, or contextually inappropriate coping strategies in response to perceived stressors tend to exacerbate negative performance and affective outcomes (Austin et al., 2010; Dyson & Renk, 2006; Giacobbi et al., 2004; Park, Armeli, & Tennen, 2004; Turner, Thompson, Huber, & Arif, 2012).

1.4. Current study

Our interpretation of this body of literature suggests that effectively understanding the influences of broad emotional functioning (i.e., emotional intelligence) and more specific cognitive and affective responses to environmental stressors (i.e., test anxiety and coping strategies) on academic success cannot be achieved through isolated investigations of individual variables. In light of the connections among student appraisals of stressful events, the coping strategies they are likely to select, and their general abilities in perceiving and regulating their emotional states, we propose that research in this domain requires examination of multiple contributing variables simultaneously.

When examining the relationships among test anxiety, EI, and coping it is important to identify that we adhere to theoretical orientations that consider both EI and test anxiety to be trait-like constructs (e.g., MacCann et al., 2011) and recognize that they are likely highly correlated constructs. Prior research suggests the strong association among the variables is likely due to EI being a hierarchically superior construct in the personality space that dictates the manifestation of test anxiety (Abdollahi & Talib, 2015). Further, consistent with existing models personality processes, we acknowledge superordinate dispositional constructs – such as test anxiety and EI – exert a dramatic influence on learners' appraisals of – and reactions to – stressful life events (Matthews, Zeidner, & Roberts, 2006).

Therefore, the present investigation was designed to explore the collective influences of EI, cognitive test anxiety and coping strategies on the academic performance of undergraduate learners. Prior research examining the relationships among these variables has traditionally focused on short-term academic performance (e.g., course or semester grades; Austin et al., 2010; Saklofske et al., 2012). The current examination is unique in that we are examining the iterative and collective influence of these variables on predicting the undergraduates' cumulative GPA values at the conclusion of their university experiences. To bolster this study's focus on the operation of the primary independent variables, we have also controlled for initial indicators of student competence by including their GPA from the end of their first year. This design enables exploration of both individual variable influences on performance, as well as the collective impact of EI, test anxiety, and coping strategies on student performance patterns during the period between the end of their first year in college to the end of their fourth year.

Based on the prior research, we hypothesized that four-year GPA would be positively associated with first year GPA, emotional intelligence, and tendency to employ adaptive coping strategies. That is, we anticipated these variables would predict higher levels of four-year GPA. We also hypothesized that there would be a detrimental impact on four-year GPA exerted by cognitive test anxiety and avoidance coping strategies. The limited findings related to emotion-focused coping led to low expectations for that variable as a meaningful predictor of four-year GPA. Finally, we predicted that the predictive power captured by emotional intelligence for four-year GPA would be influenced by adding cognitive test anxiety and coping strategies to the model. That is, we expected that while positive emotional intelligence would likely be related to performance (as demonstrated in prior research), that the addition of cognitive test anxiety (which demonstrates a higher level of perceived academic stress) and coping strategies would provide a more durable representation for learner success predictions.

2. Method

2.1. Participants

Data were collected from undergraduate students attending a mid-size public university in the Midwestern United States. In compliance with the approval for research obtained through the University Institutional Review Board, all participants provided informed consent and were able to receive course credit as part of their involvement in an undergraduate subject pool.

The participants ($N = 534$) completed the Schutte Emotional Intelligence Scale (SEIS; Schutte et al., 1998), the COPE Inventory (Carver, Scheier, & Weintraub, 1989), and the Cognitive Test Anxiety Scale-Revised (CTAR-25; Cassady & Finch, 2015) during either their second or third year at the university in a single administration setting. At that time, participants also gave permission to access university records for this research study. Data collected with the support of the institutional assessment office included gender, ethnicity, 1st year cumulative GPA, and graduating cumulative GPA. After merging collected and institutional level data, 141 participants had complete data for all variables of interest. The attrition in this sample was due to three primary causes (in order of magnitude): (a) many students provided inaccurate school-specific identification numbers precluding effective matching with demographic files, (b) others who provided accurate information had yet to reach the 4-year GPA mark by the time of data collection; and (c) student withdrawal from the university.

Given the rather large reduction in sample size following the merging of collected and institutional level data, it was decided to compare participants with complete and incomplete data on the primary variables of interest. Results of a series of independent samples *t*-tests with the Bonferroni correction revealed participants with complete data (81% female & 93% Caucasian) did not significantly differ from those with incomplete data on levels of reported EI, cognitive test anxiety, problem-focused coping, social-focused coping, avoidant coping, or emotion-focused coping.

2.2. Measures

2.2.1. Cognitive test anxiety

Cognitive test anxiety levels were assessed using the Cognitive Test Anxiety Scale-Revised (CTAR; Cassady & Finch, 2015). The CTAR is a 25-item revision to the original Cognitive Test Anxiety Scale (CTAS; Cassady & Johnson, 2002), and uses a four-point Likert-type scale common to several test anxiety measures (1 = *not at all like me*, 4 = *very much like me;* e.g., Sarason, 1984). Revisions to the original scale were driven by measurement issues that indicated a problem with the reverse-coded items in the original CTAS. Removal of the reverse-coded items resulted in a more parsimonious measure of cognitive test anxiety while maintaining the indicators of internal consistency and construct validity that were demonstrated with the original measure (Cronbach's $\alpha = 0.96$; Cassady & Finch, 2015).

2.2.2. Emotional intelligence

The Schutte Emotional Intelligence Scale (SEIS; Schutte et al., 1998) is a 33-item measure designed to assess trait emotional intelligence. Using a standard Likert scale participants indicated the extent to

which each item described them. Prior investigations have demonstrated the reliability of the measure for use among university students (Cronbach's α = 0.90; Schutte et al., 1998). Subsequent attempts to validate a factorial solution for the SEIS have generated significant divergence in the literature. Studies by Petrides & Furnham (2000) as well as Saklofske et al. (2003) attempted to generate multifactor representations for the SEIS, but were unable to validate the initial four-factor structure nor converge on similar solutions. Gignac, Palmer, Manocha, & Stough (2005) tested both of these solutions — as well as an alternative model with 6 factors. Once again, they were not able to conclude a clear multifactor solution. Gignac et al. (2005) did identify that a nested model may serve as a viable representation for the SEIS. However, subfactors in that model often included insufficient numbers of items to be durable. Given the lack of convergence in identifying a factorial solution to the SEIS, we only used the overall total EI score in our analyses, which has been shown to be durable and reliable across validation studies.

2.2.3. COPE inventory

The COPE Inventory is a 60-item measure designed to assess the use of functional and dysfunctional coping strategies. Participants indicated how often they utilized each presented coping strategy on a 4-point Likert-type scale (1 = *I usually don't do this at all*, 4 = *I usually do this a lot*). COPE items can be used to create 15, 4-item subscales: (Positive Reinterpretation and Growth, Mental Disengagement, Focus On and Venting of Emotions, Use of Instrumental Social Support, Active Coping, Denial, Religious Coping, Humor, Behavioral Disengagement, Restraint, Use of Emotional Social Support, Substance Use, Acceptance, Suppression of Competing Activities, Planning). All subscales are scored such that higher values indicate increased use of particular coping strategy. The 15 subscales demonstrated acceptable internal consistency in the current examination (see Table 1).

Conceptually, COPE subscales have been articulated to represent broad domains of coping that include problem-focused, emotion-focused, avoidant, and socially-supported strategies (Carver, Scheier, & Weintraub, 1989; Folkman & Moskowitz, 2004; Litman, 2006). It is important to note that the creators of the COPE inventory intentionally provide no guidance regarding how to combine COPE subscale scores to create indices of overarching coping constructs (e.g., problem-focused coping, emotion-focused coping). However, Carver et al. (1989) suggest factor analytic techniques can be used to generate second-order factors that can be then used as variables in an examination. Therefore, it was our decision to generate second-order factors corresponding to broader domains of coping from COPE subscales using exploratory factor analysis (EFA). The validity of the factor structure obtained via EFA was tested using confirmatory factor analysis (CFA).

To generate second-order factors representing broad coping domains, we employed a two-step sequential factor analysis process by randomly splitting our complete sample of subjects completing the COPE ($n = 534$) into two groups (*EFA Sample* $N = 210$, *CFA Sample* $N = 324$). First, we conducted an exploratory factor analysis on the 15 COPE subscales using Principle Axis Factoring with Promax rotation. To determine the number of factors to be retained the Scree plot, Kaiser's greater than one criterion (Kaiser, 1970), and parallel analysis (Horn, 1965) were used. Collectively, the identified methods suggested a four-factor solution was optimal, accounting for 65% of the total variance (see Table 1 for factor loadings). The first factor (Problem-focused coping) contained the Planning, Active coping, Suppression of competing activities, and Religious coping subscales. The second factor (Avoidance coping) contained the Denial, Substance use, Behavioral disengagement, and Mental disengagement subscales. The third factor (Social-focused coping) consisted of the Venting emotions, Use of instrumental social support, and Use of emotional social support subscales. The final factor (emotion-focused coping) contained the positive reinterpretation and growth, acceptance, and humor subscales.

To evaluate the generalizability of the identified four-factor solution, we conducted a CFA on the second sample using the diagonally weighted least squares estimation method. CFA analyses were conducted using R 3.3.1 (R Core Team 2016) and the lavaan package (Rosseel, 2012). Model fit was assessed using Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Standardized Root Mean Square Residual (SRMR). CFA results demonstrated the four-factor solution provided an adequate fit to the data, CFI = 0.91, TLI = 0.89, RMSEA = 0.09, SRMR = 0.08.

3. Results

3.1. Descriptive and correlational analyses

A series of correlational analyses were conducted to explore the relationships among the variables of interest. As expected, 1st year cumulative GPA, emotional intelligence, cognitive test anxiety and use of avoidance coping strategies, were significantly correlated with students' graduating cumulative GPA (see Table 2). However, contrary to our prediction, correlational analyses revealed cognitive test anxiety was not meaningfully associated with either emotional intelligence or emotion-focused coping strategies. This finding was surprising given previous research noting emotional intelligence provides students with the ability to successfully manage the emotional challenges associated with cognitive test anxiety (e.g., Abdollahi & Talib, 2015).

Additional examination of the correlations point to predictable relationships among cognitive test anxiety and coping strategies — with avoidance coping sharing the strongest relationship with CTA.

Table 1
Factor loadings for exploratory factor analysis with Promax rotation of COPE inventory scales.

Scales	M(SD)	α	Problem focused	Avoidance	Social-focused	Emotion focused
Planning	11.17(2.52)	0.78	**0.827**	−0.167	0.022	0.083
Active coping	10.56(2.19)	0.64	**0.842**	−0.057	0.039	−0.029
Suppression of competing activities	9.16(2.17)	0.59	0.**672**	0.270	−0.005	−0.014
Restraint	9.20(2.25)	0.64	**0.445**	0.195	−0.135	0.246
Religious coping	10.61(4.16)	0.94	0.**323**	−0.011	0.039	0.007
Denial	6.20(2.41)	0.79	0.070	**0.817**	0.033	−0.086
Behavioral disengagement	6.34(2.28)	0.76	−0.023	**0.764**	0.007	0.010
Substance use	5.56(2.65)	0.92	0.023	**0.509**	−0.017	0.090
Mental disengagement	10.08(2.38)	0.54	−0.120	**0.475**	0.154	*0.354*
Use of emotional social support	11.24(3.24)	0.88	−0.119	−0.058	**0.996**	0.094
Use of instrumental social support	11.27(2.73)	0.81	0.195	−0.054	**0.646**	0.117
Focus on venting emotions	10.00(3.11)	0.82	0.088	0.203	**0.757**	−0.292
Positive reinterpretation and growth	12.00(2.63)	0.83	0.195	−0.144	0.104	**0.670**
Humor	9.40(3.13)	0.88	−0.060	*0.303*	−0.119	**0.616**
Acceptance	10.81(2.26)	0.63	0.156	−0.026	−0.059	**0.513**

Note: Factor loadings were considered meaningful if they fell above the criterion value of 0.30 (Tabachnick & Fidell, 2013).

Table 2
Pearson's product moment correlation coefficients for 4-year GPA, cognitive test anxiety, problem-focused coping, avoidance coping, social-focused coping, and emotion-focused coping.

	1	2	3	4	5	6	7	8
1. 1st year cumulative GPA	1							
2. Total emotional intelligence	−0.04	1						
3. Cognitive test anxiety	0.05	−0.16	1					
4. Problem-focused coping	−0.05	0.34**	0.09	1				
5. Avoidance coping	−0.09	−0.24**	0.36**	0.16	1			
6. Social-focused coping	−0.16	0.34**	0.18*	0.50**	0.04	1		
7. Emotion-focused coping	−0.05	0.40**	0.00	0.57**	0.09	0.27**	1	
8. 4-year grade point average	0.25**	0.18*	−0.33**	−0.03	−0.32**	0.01	−0.12	1
M(SD)	2.59(0.64)	124.87(17.39)	47.77(15.17)	2.53(0.48)	1.76(0.45)	2.70(0.65)	2.68(0.52)	3.36(0.39)

Note: $N = 141$ for all analyses.
* $p < 0.05$.
** $p < 0.01$.

Emotional intelligence was positively related to social-, emotion-, and problem-focused coping strategies and negatively related to avoidance strategies. Worthy of discussion, the first-year GPA values were unrelated to EI, CTA, and coping strategies, which led to attention to the value of first year GPA as a predictor in our primary analysis.

3.2. Hierarchical regression analysis

To more directly explore the iterative as well as the collective influence of the independent variables on four-year GPA, two theoretically-driven hierarchical multiple regression analyses were conducted and examined. Hierarchical regression analysis was chosen as the primary analysis technique in the current examination because the method afforded two primary benefits. First, the procedure allowed us to evaluate the unique influence of each of the independent variables on the outcome of interest. Second, the use of hierarchical regression analysis allowed for the simultaneous investigation of the incremental validity of the predictor variables. That is, the use of hierarchical regression permitted us to examine the extent to which adaptive and maladaptive coping tendencies and cognitive test anxiety predicted long-term academic achievement beyond broad levels of social-emotional competence (i.e., EI).

The only difference between the two regression analyses was the inclusion of first-year GPA. As an early indicator of college success, we deemed that initial performance check of interest to predicting long-term success. However, given the low correlations shared between first-year GPA and the other study variables (besides four-year GPA) as well as the considerably lower values noted in first year GPA than in final graduating GPA of the study sample, we concluded that an additional review of the relationships among the variables without the control influence of first year GPA was worthy of attention. For simplicity, our primary focus will be on the more inclusive regression model that included four-year GPA.

3.2.1. Assumption checks

Examination of residual values revealed no issues with normality, homoscedasticity, or independence of error which suggests the primary assumption multivariate normality was met. Additionally, VIF and Tolerance values fell within accepted ranges suggesting there were no issues with multicollinearity in the current examination.

3.2.2. Stage one

At the first stage, 1st year cumulative GPA was entered into the regression model to control for the influence of previous academic ability on long-term academic achievement. Results revealed that at step one, 1st year GPA was positively related to graduating cumulative GPA and contributed significantly to the regression model, $F(1, 139) = 10.01$, $p < 0.05$, $R^2 = 0.06$. This finding suggests that students who demonstrated greater academic performance during their first year tended to possess a higher GPA at graduation.

3.2.3. Stage two

Emotional intelligence was entered during the second step of the regression analysis as levels of this broad hierarchical construct have been shown to influence students' perceptions of and responses to academic stressors. Results at stage two revealed that the introduction of emotional intelligence increased the amount of variance explained in four-year cumulative GPA, $\Delta R^2 = 0.03$, $F(1, 138) = 5.99$, $p < 0.05$. This result suggests that levels of emotional intelligence contribute significantly to graduating cumulative GPA – after controlling for previous academic ability – such that increased levels of emotional intelligence are associated with increased academic performance at graduation.

3.2.4. Stage three

At the third stage of the analysis, cognitive test anxiety was entered. Cognitive test anxiety was entered at this stage of the analysis as previous research has demonstrated ones' ability to perceive and regulate their emotional states – i.e. emotional intelligence – may protect against the experience of cognitive test anxiety during evaluative situations. Once again, the inclusion of cognitive test anxiety resulted in a significant improvement in the amount of variance explained by the regression model, $\Delta R^2 = 0.10$, $F(1, 137) = 17.31$, $p < 0.05$. Interestingly, the inclusion of cognitive test anxiety at the third stage of the regression analysis reduced the predictive utility of emotional intelligence to a non-significant level. These findings suggest cognitive test anxiety is a significant predictor of graduating cumulative GPA such that increased levels of test anxiety are associated with reduced overall levels of academic performance. Perhaps most notably, these findings suggest the experience of cognitive test anxiety is more impactful to graduating cumulative GPA than levels of emotional intelligence.

3.2.5. Stage Four

In the final block of this planned hierarchical regression, the four coping factors (Problem-focused, Avoidance, Social-focused, and Emotion-focused) were entered into the regression model. Coping variables were included during the last step of the analysis to test the unique variance that specific coping variables contributed to university grade performance after controlling for the impact of initial performance indicators, broad emotional intelligence, and cognitive test anxiety. The inclusion of the coping variables at this stage resulted in a significant increase in the amount of variance explained in the outcome (Total $R^2 = 0.26$), $F(4, 133) = 2.65$, $p < 0.05$. However, this increase in explained variance was primarily driven by the inclusion of emotion-focused coping. That is, emotion-focused coping was found to be the only coping strategy that significantly predicted graduating cumulative GPA after controlling for prior achievement, EI, and cognitive test anxiety. This finding revealed that the use of emotion-focused coping strategies was associated with lower cumulative GPA at graduation.

Table 3
Hierarchical regression analyses predicting graduation GPA (with and without 1st year GPA).

Variable	β	Variable	β
Step 1 ($R^2 = 0.06$)			
1st year GPA	0.25**		
Step 2 ($R^2 = 0.10$; $\Delta R^2 = 0.03$*)		Step 1 ($R^2 = 0.031$)	
1st year GPA	0.26**		
EI	0.19*	EI	−.18
Step 3 ($R^2 = 0.20$; $\Delta R^2 = 0.10$***)		Step 2 ($R^2 = 0.13$; $\Delta R^2 = 0.10$***)	
1st year GPA	0.28***		
EI	0.14	EI	.13
CTA	−0.32***	CTA	−0.31***
Step 4 ($R^2 = 0.26$; $\Delta R^2 = 0.05$*)		Step 3 ($R^2 = 0.20$; $\Delta R^2 = 0.08$**)	
1st year GPA	0.25**		
EI	0.16	EI	.16
CTA	−0.27**	CTA	−0.25***
Avoidance coping	−0.16	Avoidance coping	−0.20*
Problem-focused	0.07	Problem-focused	.07
Social-focused	0.03	Social-focused	.03
Emotion-focused	−0.21*	Emotion-focused	−0.23*

Note. $N = 141$. EI — emotional intelligence; CTA — cognitive test anxiety.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

3.2.6. Alternative regression model

As mentioned, a parallel regression analysis was conducted with the only change involving the removal of first-year GPA. As shown in Table 3, comparison of the relative influence of GPA and the other predictor variables reveals that first year GPA essentially accounts for an additional 6% of the variance in the prediction of four-year GPA. The only other noted difference was that when first year GPA was not included as a predictor, Avoidance Coping gained a small amount of predictive power (producing a reliable predictive value). The overall change in predictive power for avoidance coping was small, as can be seen through comparison of the standardized beta weights in the two tested models (Table 3). In fact, comparison of the two regression models illustrates remarkably consistent estimates for each of the predictors when first year GPA was and was not controlled. This was a surprising effect, as we anticipated that the level of first year GPA might influence the perceptions and responses to academic stressors in the undergraduate population.

4. Discussion

A growing body of literature illustrates that understanding student variations in academic outcomes can be improved by research that includes factors examining the perception, representation, and management of conditional stressors (Giacobbi et al., 2004; Saklofske et al., 2012; Turner et al., 2012). Consistent with that framework, the primary purpose of the current investigation was to examine both the individual and collective influences of emotional intelligence, cognitive test anxiety, and coping strategies on college students' graduating cumulative GPAs after controlling for their initial academic competence (i.e., 1st year cumulative GPA).

Our results confirmed several prior findings. Results of the current examination demonstrated that students with high levels of emotional intelligence enjoyed higher levels of academic performance over their university careers. This finding is consistent with the results of prior research noting the facilitative influence of emotional intelligence – when considered in isolation from other predictor variables – in promoting students' long-term academic achievement (Fernández et al., 2012; Jaeger & Eagan, 2007). Notably, the magnitude of the relationship between EI and academic performance observed within the current examination ($r = 0.18$) is consistent with results of recent meta-analytic efforts noting the existence of a modest relationship between trait EI and learners' academic achievement ($r = 0.20$; Perera & Digiacomo, 2013).

Additionally, our results confirmed prior findings demonstrating that cognitive test anxiety is detrimental to the academic performance of undergraduate students (Cassady, 2004a; DeCaro et al., 2011; Zeidner & Matthews, 2005). Results of the current examination also bolster previous findings illustrating the maladaptive influence of employing emotion-focused and avoidance coping strategies in response to academic stressors. Consistent with prior work (e.g. MacCann et al., 2011, Saklofske et al., 2012), reported the use of emotion-focused coping strategies was associated with decreased academic performance among undergraduate learners.

The results also demonstrated that the simple relationship between Emotional Intelligence and long-term success was not durable once accounting for other individual factors (i.e., test anxiety and coping strategies). This is consistent with the conclusion offered by Barchard (2003), who demonstrated that EI as a general predictor of academic success was not as successful as traditional cognitive and personality factors for an undergraduate sample. As such, our results suggest that a measure of general EI provides little explanatory power to understanding long-term student performance in college and attention should be directed toward more specific variables examining perceptions and responses to academic stressors.

Researchers in the field of emotional intelligence will often rightly raise the question of measurement of EI when accounting for the lack of explanatory power EI demonstrated in this study. For the current study, we utilized the SEIS (Schutte et al., 1998) which represents the "mixed" measurement model of EI and conceptualizes emotional intelligence as a constellation of abilities and trait-like dispositions that guide emotion regulation (e.g., mixed view of EI; MacCann et al., 2011). Researchers in the domain of emotional intelligence have questioned the validity of these instruments due to their reliance on self-judgements as a means of assessing ability. That is, researchers have suggested that factors related – and unrelated – to emotional intelligence may prevent individuals from accurately reporting on their ability to effectively process emotions (Mayer, Roberts, & Barsade, 2008). Further, these instruments typically assess factors that are not directly related to the EI construct and as such may further muddle the relationship among EI and other constructs (Mayer, Roberts, & Barsade, 2008). Therefore, one explanation for the lack of explanatory power related to EI could be attributed to the introduction of measurement error stemming from the nature of the instrument. However, our results are concordant with Barchard's (2003) findings examining the influence of EI on academic success, and her study validated the findings with multiple measures of EI – suggesting that our findings are likely not unduly impacted by a mere measurement artifact.

4.1. Coping and cognitive test anxiety

The current examination supports prior studies examining the relationships among test anxiety, coping, and performance. The results are clearly consistent with the skills deficit model of test anxiety, which suggests that performance decrements for test anxious learners are a consequence of effectively encoding, storing, or retrieving information during test preparation and test performance conditions (Cassady, 2004b; Geen, 1980; Naveh-Benjamin, 1991; Zeidner, 1998). These skills deficiencies include not only basic cognitive operational failures, but also a tendency to engage in inefficient or unproductive test preparation strategies (e.g., procrastination; Kalechstein, Hocevar, Zimmer, & Kalechstein, 1989). Consistent with this view, our results illustrated a moderate correlation between cognitive test anxiety and the use avoidance coping strategies — suggesting that test anxious students increasingly rely on coping strategies that prevent effective encoding of academic information (i.e. avoidance of material, mental disengagement; Stöeber, 2004; Zeidner & Matthews, 2005).

The selection of avoidance coping strategies is a common approach for those with test anxiety in response to salient evaluative stress, essentially to promote a reduction in the immediate experience of manifested cognitive test anxiety symptoms (Zeidner & Matthews, 2005). However, avoidance strategies are bound to exacerbate long-term academic failure or underperformance. The simple suggestion for this has been to promote more active or adaptive coping strategies. However, in our study — reported use of active coping strategies was ineffective for predicting academic success. This may be due to unrealistically high ratings test anxious learners place on their employed active coping strategies. Prior work has demonstrated that high-test anxious students tend to report higher levels of test preparation activity — however, review of those activities has illustrated they tend to be less efficient or effective (Culler & Holohan, 1980; Wittmaier, 1972).

Our results suggest strategies designed to support learners with high levels of perceived academic stress (e.g., high cognitive test anxiety) should incorporate a multifaceted approach focused on developing self-regulatory strategies. First in this process should be helping learners identify the need and value for adopting active coping strategies to confront academic challenges (Schunk, 1999). However, the training process likely needs to go further, helping learners to not only recognize the value of self-regulation in school – but also basic instruction on how to implement – and sustain – productive studying practices (i.e. following a study routine, adopting a deep approach to studying; avoiding sources of distraction; Nonis & Hudson, 2010; Okpala, Okpala, & Ellis, 2000). Simultaneously, prior research suggests that training students on more adaptive and active strategies to manage the symptoms of test anxiety should also be employed (e.g., psychophysiological coherence, systemization desensitization therapy, deep breathing, muscle relaxation; Bradley, McCraty, Atkinson, Tomasino, Daugherty, & Arguelles, 2010; Larson, Ramahi, Conn, Estes, & Gibellini, 2010). It is our contention that this multifaceted intervention approach will support the academic performance by providing students with strategies capable of reducing the feelings of anxiety that influence performance within learning situations — ideally limiting the predominance of Avoidance coping strategies among test-anxious students. However, this intervention alone will not support the goal of promoting long-term academic success — which is where the supportive training of study skills is anticipated to provide facilitative benefits.

4.2. Limitations

While the ability to track a cohort of students across their four years in the university provides a considerable benefit to this study, there are limitations imposed by this institution-wide approach to data collection that warrants mention. First, our inability to include covariates beyond learners' first-year GPA likely limited the relative efficiency of our analyses and our ability to explain variance in the outcome of interest. Furthermore, the current study's focus on long-term educational success limited the investigation to students who completed a four-year university program. It is important to acknowledge that students who persisted until their fourth year of university differ in important ways from those students who do not persist to the conclusion of their college education (although our analyses illustrated no significant difference among those who were not followed and the final study participants on the primary variables of interest). Finally, a limitation of the current examination is based on the sampling frame (which was predominantly Caucasian and female). The result was a sample that was limited in terms of age, gender, and ethnicity. As such, it is important to express caution when attempting to generalize our findings.

4.3. Conclusion

In summary, this analysis explored the iterative influence of emotional intelligence, cognitive test anxiety, and coping strategies on undergraduate students' graduating cumulative GPAs after controlling for early collegiate academic performance. Results of this examination replicated prior work on the relationships among emotional intelligence, test anxiety, emotion-focused coping and academic performance. Perhaps more importantly, our examination generated novel findings that advance our current understanding of the topics under investigation. Prior work in the domain of emotional intelligence traditionally relied on simplified representations which model the influence of the construct on learner performance in isolation from other potential predictors. Our findings highlight the potential folly in this approach by demonstrating that specific affective and behavioral responses to academic stressors demonstrated the incremental predictive validity and captured unique variance in long-term academic performance not accounted for by broad levels emotional intelligence. It is our hope that these preliminary findings will spur researchers to begin efforts to build models for understanding student success in higher education that go beyond simplified representations of these complex constructs and acknowledge the interactive influence of broad social-emotional dispositions and more specific affective and behavioral responses on learners ability to manage environmental demands.

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