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Teasing Apart the Effect of Depression Specific and Anxiety Specific Symptoms on Academic Outcomes

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Research shows that adolescents' performance in school can be negatively affected by depression and anxiety. However, past studies have used nonspecific measures of depression and anxiety that preclude researchers from understanding their unique effects. The current study addressed this gap in the literature by teasing apart the effects of depression specific and anxiety specific symptoms on end of semester grade point average (GPA) and the likelihood of dropping a course. We used a 3-month longitudinal design with a sample of 130 United States (U.S.) undergraduates. Results showed that only cumulative GPA and ACT score predicted end of semester GPA. However, high levels of anxiety specific (anxious arousal), but not depression specific (anhedonia), symptoms predicted whether or not a student dropped a course. These results suggest that targeting anxiety specific symptoms in schools may be effective in improving academic outcomes.

Keywords: depression, anxiety, academic achievement.

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Introduction

Depression and anxiety are two of the most common forms of mental illness in children and adolescents, affecting more than 6.3 million young people in the United States [8]. Adolescents with depression and anxiety not only experience emotional suffering, but also impairments in multiple areas of functioning, such as school achievement. For example, depression has been shown to predict decreased grade-point averages in adolescents [12; 16] as well as an increased likelihood of dropping out of school [5; 14]. Similarly, anxiety has been shown to lead to poor school attendance, impaired school performance, and reduced rates of attending college [13; 22; 30; 33]. Subject specific anxiety (e.g., math anxiety, reading anxiety) has also been shown to have a negative relationship with achievement in those domains [2; 26; 29]. The negative consequences of depression and anxiety on academic outcomes appear to be robust as they appear to hold across gender as well as cultures [4; 15; 17].

This work indicates that depression and anxiety may be important risk factors for poor academic outcomes. However, a limitation of this research is that most studies have used measures of depression and anxiety that are non-specific. Research shows that commonly used measures of depression and anxiety (e.g., Beck Depression Inventory, Beck Anxiety Inventory, Center for Epidemiological Studies Depression Scale, etc.) assess a general distress factor, like neuroticism, that is common to both depression and anxiety. These measures make it difficult to distinguish between depression specific and anxiety specific symptoms [6; 20; 21; 24; 25; 28]. This is problematic as depression and anxiety symptoms are often comorbid. Thus, it remains unclear if it is depression or if it is anxiety (or if it is the non-specific symptoms of distress) that is driving the association between negative mood and poor academic outcomes. However, it is possible to distinguish between the unique effects of depression and anxiety by examining symptoms that are specific to each syndrome (anhedonic symptoms for depression and anxious arousal symptoms for anxiety). In other words, one can take the overarching factor of general distress and break it down into its lower order, more specific symptom components. It is important to unpack the general effect of negative mood (i.e., neuroticism) on academic outcomes for a few reasons. First, it is critical for informing our etiological theories of how mood affects academic outcomes. Second, it is important for creating effective interventions because interventions targeted at reducing anxiety tend to emphasize different strategies (e.g., exposure) than those focused on depression (e.g., cognitive restructuring).

The purpose of the current study is to fill this gap in the literature and examine the unique contributions of depression specific and anxiety specific symptoms to poor academic outcomes. We hypothesized, consistent with prior research, that a measure of general distress would be associated with future academic outcomes (grade point average

[GPA] and dropping a course). We did not have a hypothesis about whether or not depression specific symptoms or anxiety specific symptoms would be a stronger predictor of academic outcomes as this is one the first studies to test their independent effects in a longitudinal design.

Method

Power Analysis

The sample size of 130 and a 5-predictor variable equation was used for the statistical power analyses (G*Power). The alpha level used was $p < .05$. The analysis showed that the statistical power for this study was .80 for detecting a small to medium effect ($R^2 = .10$).

Participants

Participants were 130 undergraduates (94 female, 36 male; $M_{age} = 18.91$, $SD_{age} = 1.08$) recruited from a medium-sized private university in the United States. All participants were volunteers from the university's psychology research participant pool. The ethnicity of the sample was: 64% Caucasian, 20% Hispanic, 13% Asian, 3% African American. The average ACT score reported in this sample was 33, which is greater than the average ACT score of 21 in the United States (ACT, Inc., 2016). The average GPA in this sample was 3.48 ("B+" average), which is similar to the average GPA of 3.30 for students attending private four-year colleges in the United States [27]. There were no exclusion criteria, and all participants from the extra credit participant pool who volunteered to participate were included in the study. All procedures were approved by the institution's human subject review board.

Participants in this study were from a data set previously published by Alatorre and colleagues [1]. The hypotheses and independent variables tested in this short report are unique to this investigation. Alatorre and colleagues [1] and the current study are the only publications that have used this data set.

Measures

Depression and Anxiety specific symptoms. The Mood and Anxiety Symptom Questionnaire (MASQ; [31]) is a self-report questionnaire that assesses symptoms of depression and anxiety based on the tripartite theory of anxiety and depression [9]. According to the tripartite theory, the affective symptom structure of anxiety and depression includes a higher-order, negative affect factor (common to both depression and anxiety), and two lower order-factors, anhedonia (specific to depression) and anxious arousal (specific to anxiety). By examining the two lower order factors it is possible to tease apart depression specific and anxiety specific effects from the non-specific effects of negative mood. To this end, the MASQ was used to assess general distress (non-specific negative affect), anxious arousal (anxiety specific), and anhedonic symptoms (depression specific). The general distress scale has 15 items (e.g., irritability and difficulty concentrating) that assess symptoms hypothesized to be common to both depression and anxiety. The anhedonic subscale contains 22 items that assess symptoms hypothesized to be specific to depression such as low positive affect (example items: "Felt like nothing was

very enjoyable", "Felt like there wasn't anything interesting or fun to do", "Felt really happy"). The anxious arousal subscale has 17 items that assess symptoms hypothesized to be relatively specific to anxiety such as somatic tension and hyperarousal (example items: "Felt numbness or tingling in my body", "Felt like I was choking", "Hands were cold or sweaty"). The MASQ has demonstrated good reliability and validity in prior research (e.g., [31]). Coefficient alpha for the general distress, anxious arousal, and subscales were .81, .90, and .93, respectively.

To our knowledge, the MASQ does not have established cut-offs or norms. There is one study [7] that recommended a clinical cut-off score of 76 for the anhedonic subscale of the MASQ. However, this study has yet to be replicated and it did not establish cut-offs for anxious arousal and general distress. As expected in a relatively healthy college sample, only a small proportion of participants reached the clinical cut-off score for depression (25 of 130). Given the lack established cut-offs, we compared the MASQ scores in the current study to those reported in prior research to ensure the sample's representativeness. The mean scores found in this study (anhedonic subscale = 61, anxious arousal = 22) were highly similar to the mean scores reported in previous research using non-clinical college samples. For example, Nitschke and colleagues [23] reported a mean anhedonic subscale score of 57 and an anxious arousal subscale score of 27 in a sample of 783 undergraduates; Haeffel and Mathew [19] reported a mean score on the MASQ anhedonic subscale score of 59 in a sample of 148 undergraduates; Goodson and Haeffel [18] reported a mean score on the MASQ anhedonic subscale score of 54 and an anxious arousal subscale score of 22 in a sample of 84 undergraduates.

Academic Outcomes. We assessed two academic outcomes: end of semester GPA (not cumulative GPA; 0 = "F", 1 = "D", 2 = "C", 3 = "B", 4 = "A") and whether or not a participant dropped a course (coded 0 or 1; 0 = did not drop a course and 1 = did drop a course). End of semester GPA was obtained from the registrar. Cumulative GPA, which was used as a covariate, was self-reported at the beginning of the study.

Procedure

The study used a 3-month prospective longitudinal design. At the start of the academic semester, participants were administered the baseline measures: demographics, general academic achievement (cumulative GPA and ACT score), and mood (general distress, depression specific symptoms, and anxiety specific symptoms). At the end of the semester, approximately 3 months later, participants were administered a questionnaire asking if they had dropped any courses and were again administered the mood measures (96% of the sample completed both time points).

Results

Means and inter-correlations of study measures are summarized in Table 1. All participants completed at least 85% of the items on all questionnaires; no missing data transformations were applied. We used hierarchical multiple regression to test the effect of depression and anxiety on end of semester GPA (for that specific semester only). Assumptions of linear regression were met (linearity; independence, Durban-Watson = 1.52; and homoscedasticity; tests of multicollinearity among symptoms subscales showed

acceptable tolerance levels, all > .40) with the exception of normality in which there was an outlier. A log transformation of the variables to increase normality did not affect the linear regression results reported below. Logistic regression was used to examine the dichotomous outcome of dropping a course.

Table 1

Descriptive statistics and correlations for study variables

	Year	Gender	Cum-GPA	ACT	Distress	Depression	Anxiety	Sem-GPA	Dropped Course
N	130	130	128	130	130	130	130	80	124
Missing	0	0	2	0	0	0	0	50	6
Mean	1.74	.72	3.48	32.60	28.50	61.4	22.0	3.62	.21
Median	1.00	1.00	3.51	33.00	27.0	63.0	18.0	3.70	.00
Standard deviation	.94	.45	.35	2.00	8.41	15.1	7.64	.29	.41
Minimum	1	0	2.00	26	15.0	23	17	2.75	0
Maximum	4	1	3.97	35	53	98	49	4	1

		1	2	3	4	5	6	7	8	9
1. Year		-								
2. Gender	Pearson's r	.103	-							
	p-value	.244								
3. Cum-GPA	Pearson's r	.132	-.006	-						
	p-value	.137	.949							
4. ACT	Pearson's r	-.120	-.110	.424***	-					
	p-value	.160	.212	< .001						
5. Distress	Pearson's r	-.094	-.012	.079	.018	-				
	p-value	.286	.894	.376	.843					
6. Depression	Pearson's r	.087	.145	.016	-.016	.580***	-			
	p-value	.328	.100	.858	.856	< .001				
7. Anxiety	Pearson's r	-.034	-.076	-.022	-.124	.632***	.283**	-		
	p-value	.698	.389	.808	.161	< .001	.001			
8. Sem-GPA	Pearson's r	.256*	.066	.554***	.326**	-.047	.022	-.168	-	
	p-value	.022	.562	< .001	.003	.681	.843	.137		
9. Dropped Course	Pearson's r	-.118	-.004	-.243**	-.052	.165	.046	.283**	-.198	-
	p-value	.191	.968	.007	.563	.066	.609	.001	.080	

Notes. Year: 1 – freshmen, 2 – sophomore, 3 – junior, 4 – senior. Gender: 0 – male, 1 – female. Cum-GPA – cumulative grade point average; Distress – MASQ general distress subscale; Depression – MASQ anhedonic

subscale; Anxiety – MASQ anxious arousal subscale; Sem-GPA – semester grade point average. Dropped_Course: 0 – did not drop, 1 – drop. * – $p < .05$; ** – $p < .01$; *** – $p < .001$.

We used 4 total equations for each outcome. Three equations were used to test the effect of each independent variable (general distress, depressive symptoms, and anxious symptoms) on academic outcomes; then, a fourth equation was used in which the significant predictors were entered simultaneously. In each regression equation, the independent variables were entered into the equation in two steps. In step one, covariates of cumulative GPA, year in school, and ACT score were entered (note that results remained the same if gender and race were also included as covariates). Cumulative GPA and ACT were chosen as covariates to control for prior academic achievement. We acknowledge that this may be an overly stringent test of our hypotheses as cumulative GPA and ACT score may have also been influence by lifetime history of depression and anxiety. However, the purpose of this study was to test the incremental effect of depression and anxiety symptoms on future academic outcomes in the current college semester. Year in school was chosen as a covariate because it might be related to dropping a course (e.g., seniors may more easily drop a course knowing they already have enough credits to graduate). In step 2, we entered the mood predictors.

Predicting End of Semester GPA

Results did not support hypotheses. There was not a significant effect of general distress ($b = .00$; $t = -.42$, $p = .68$; partial $r = -.05$), depression specific symptoms ($b = .00$; $t = -.18$, $p = .86$; partial $r = -.03$), or anxiety specific symptoms ($b = .00$; $t = -.95$, $p = .35$; partial $r = -.11$) on end of semester GPA. The only statistically significant predictors of end of semester GPA (for that specific semester) was cumulative GPA from baseline ($b = .51$; $t = 4.94$, $p < .001$; partial $r = .50$) and ACT score ($b = .04$; $t = 2.19$, $p = .03$; partial $r = .25$).

Predicting a Dropped Course

Results supported our hypotheses. There was a significant effect of general distress ($\chi^2 = 5.34$, $p = .02$) on the likelihood of a student dropping a course (see Table 2 and Figure 1). Students with higher levels of general distress were more likely to drop a course than students with lower levels of general distress. There was also a significant main effect of cumulative GPA from baseline ($\chi^2 = 7.16$, $p = .007$) on dropping a course. Students with lower GPAs were more likely to drop a course than students with higher GPAs. Next, we tested the specificity hypothesis. Results showed that there was a significant main effect of anxiety specific symptoms ($\chi^2 = 9.98$, $p = .002$), but not depression specific symptoms ($\chi^2 = .90$, $p = .34$) on the likelihood of a student dropping a course (see Table 2 and Figure 2).

Importantly, when all significant predictors were entered simultaneously, only anxiety specific symptoms ($\chi^2 = 4.81$, $p = .03$) remained a significant predictor of whether or not a student dropped a course (see Table 2) even when controlling for cumulative GPA and ACT score (note that results remain the same if depression specific symptoms were also entered into the equation). That said, although anxiety specific subscale was the only symptom scale to be a significant predictor of dropping a course, the difference in odds-ratios among the subscales was not large.

Table 2

Logistic regression analyses predicting whether or not a participant dropped a course

Model Coefficients – Dropped Course

		95% Confidence Interval						95% Confidence Interval	
Predictor	**Estimate**	**Lower**	**Upper**	**SE**	**Z**	**p**	**Odds ratio**	**Lower**	**Upper**
Intercept	-.245	-8.525	8.034	4.224	-.058	.954	.782	1.98e-4	3084.162
Year	-.204	-.764	.356	.286	-.715	.475	.815	.466	1.427
Cum-GPA	-1.975	-3.475	-.475	.765	-2.581	.010	.139	.031	.622
ACT	.126	-.166	.419	.149	.845	.398	1.134	.847	1.520
Distress	.064	.009	.120	.028	2.293	.022	1.067	1.009	1.127

Note. Estimates represent the log odds of "Dropped Course = 1" vs. "Dropped Course = 0".

Model Coefficients – Dropped Course

		95% Confidence Interval						95% Confidence Interval	
Predictor	**Estimate**	**Lower**	**Upper**	**SE**	**Z**	**p**	**Odds ratio**	**Lower**	**Upper**
Intercept	.665	-7.424	8.755	4.127	.161	.872	1.945	5.97e-4	6341.481
Year	-.243	-.789	.304	.279	-.871	.384	.785	0.454	1.355
Cum-GPA	-1.720	-3.169	-.311	.729	-2.387	.017	.176	0.042	.733
ACT	.113	-.171	.398	.145	.780	.435	1.120	0.843	1.488
Depression	.011	-.020	.041	.016	.699	.484	1.011	0.981	1.042

Note. Estimates represent the log odds of "Dropped Course = 1" vs. "Dropped Course = 0".

Model Coefficients – Dropped Course

		95% Confidence Interval						95% Confidence Interval	
Predictor	**Estimate**	**Lower**	**Upper**	**SE**	**Z**	**p**	**Odds ratio**	**Lower**	**Upper**
Intercept	-1.392	-9.908	7.124	4.345	-.320	.749	.249	4.98e-5	1241.778
Year	-.208	-.774	.359	.289	-.718	.472	.812	.461	1.432
Cum-GPA	-1.912	-3.458	-.367	.788	-2.426	.015	.148	.032	.693
ACT	.149	-.156	.454	.156	.955	.339	1.160	.855	1.574
Anxiety	.092	.033	.150	.030	3.060	.002	1.096	1.034	1.162

Note. Estimates represent the log odds of "Dropped Course = 1" vs. "Dropped Course = 0".

Model Coefficients – Dropped Course

		95% Confidence Interval						95% Confidence Interval	
Predictor	**Estimate**	**Lower**	**Upper**	**SE**	**Z**	**p**	**Odds ratio**	**Lower**	**Upper**
Intercept	-1.341	-9.881	7.199	4.357	-.308	.758	.262	5.11e-5	1337.912
Year	-.204	-.771	.363	.289	-.706	.480	.815	.463	1.437
Cum-GPA	-1.901	-3.454	-.347	.793	-2.398	.016	.149	.032	.707
ACT	.149	-.157	.454	.156	.953	.340	1.160	.855	1.574
Anxiety	.094	.029	.159	.033	2.819	.005	1.099	1.029	1.173
GSTRESS_2	-.006	-.070	.059	.033	-.170	.865	.994	.932	1.061

Note. Estimates represent the log odds of "Dropped Course = 1" vs. "Dropped Course = 0".

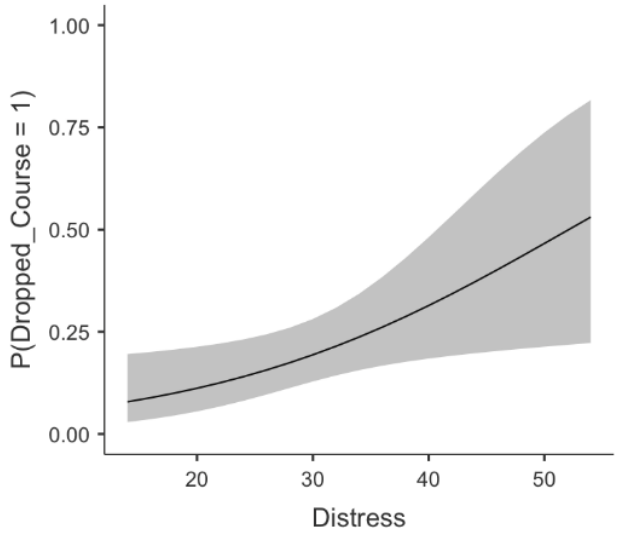

Figure 1.
Odds ratio of dropping a course
as a function of distress level

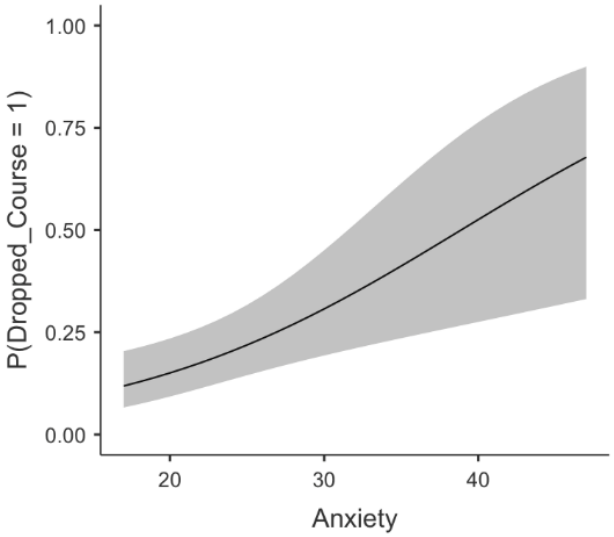

Figure 2.
Odds ratio of dropping a course as a
function of anxiety specific symptom level

Discussion

Prior research shows that depression and anxiety are related to academic performance. However, these studies could not distinguish between the unique effects of depressive and anxious symptoms, respectively. The purpose of the current study was to address this limitation and test the specific effects of these constructs on academic outcomes. Consistent with prior research, results showed that general distress was associated with the likelihood of a student dropping a course. This finding was due specifically to anxiety, not depression. The present findings add to a growing body of research showing the detrimental effects of anxiety in school [11]. In particular, these results suggest that anxiety specific symptoms may increase avoidance-related behaviors,

which may ultimately interfere with their overall academic functioning. The next step in this line of research is to determine the mechanisms by which anxiety exerts its negative effects (e.g., avoidance) as well identify potential moderators that determine the strength the effects (e.g., time of onset, comorbid conditions, parental psychopathology).

Our results also raise questions. First, why were none of the symptom measures associated with GPA? One explanation is that our longitudinal period was too short. We examined GPA for a single semester, which is a snapshot in time relative to a four-year college career. It is possible that anxiety and depression would predict GPA over longer time periods. Further, students in the study who received low grades in the past were more likely to drop a class, which may have decreased variability in the GPA (i.e., created a truncated range). Second, why were depression specific symptoms not a significant predictor of any academic outcome? The most parsimonious explanation is that depression is not a strong predictor of academic outcomes and that prior results in which depression was linked to academics were due to the non-specific nature of the measures used (and comorbid anxiety was driving the results). However, it is important to replicate the current findings before making definitive statements about the association between depression and academic outcomes.

The study had both strengths and limitations. Strengths include a longitudinal design that allowed us to establish temporal precedence among the study variables (i.e., anxiety specific symptoms preceded and predicted a dropped course). Additionally, we used symptom specific measures for anxiety and depression so that we could tease apart their unique influence on academic outcomes. There were also limitations. Most concerning is the degree to which the results will generalize to other student populations. The students in this sample were very high achieving (higher than average ACT scores and GPAs), mainly white, and from a selective private University. Further, the students in the study had relatively low levels of depression and anxiety, and thus, our results may not generalize to students with clinically significant depression or anxiety. An additional limitation is that we only tested two academic outcomes – end of semester GPA and dropping a course. It is possible that depression specific symptoms have a negative effect on academic outcomes not measured in this study (e.g., low motivation, attendance rates, or performance-based measures). Similarly, we focused only on depression and anxiety, which may not fully capture participants' psychological health. For example, according to the dual-factor model of mental health, subjective well-being must be considered alongside symptoms of psychopathology to fully assess one's psychological wellness [3].

Conclusion

In conclusion, our study is among the first to tease apart the specific effects of depression specific and anxiety specific symptoms on academic outcomes. Our findings indicate that anxiety, not depression, may be a stronger predictor of poor academic outcomes such as dropping a class. If our results stand up to replication and generalize to other academic outcomes, then this would suggest that interventions in schools targeting anxiety would be more productive in improving some academic outcomes (e.g., student retention) than interventions targeting depression. Indeed, research shows that attempts to mitigate anxiety have positive effects on academic performance [32]. The next stop in this line of research is to understand the mechanisms by which anxiety exerts its negative

influence on poor academic outcomes. For example, it might be that anxiety leads to cognitive interference on tasks [10] or it might exert its influence more proximally in the form of test anxiety [34]. We look forward to future work to more fully understand the factors that mediate the anxiety to academic outcomes association.

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Исследования показывают, что депрессия и тревожность могут оказывать негативное влияние на школьную успеваемость подростков. Однако в предыдущих работах использовались неспецифические методы измерения депрессии и тревоги, что затрудняет понимание их уникального эффекта на академические результаты. Настоящее исследование направлено на устранение этого пробела и дифференцирует степень влияния специфических симптомов депрессии и тревоги на средний балл по учебным дисциплинам (Grade Point Average, GPA) и на вероятность отказа подростка от продолжения курса обучения. Авторы провели трехмесячное лонгитюдное исследование 130 учащихся из США. Результаты показали, что только совокупный средний балл по GPA и стандартизированному тесту для поступления в колледжи США (American College Testing, ACT) предсказывает средний балл GPA в конце семестра. Высокий показатель специфических для тревожности симптомов (тревожное возбуждение) являлся предиктором того, продолжит ученик курс или нет, тогда как для специфических для депрессии симптомов (ангедония) такой связи не выявлено. Данные результаты позволяют предположить, что выделение специфических симптомов тревожности в школах может быть эффективной мерой для улучшения успеваемости.

Ключевые слова: депрессия, тревожность, академическая успеваемость.

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