Low GPA and College Attrition Predictive Factors: Using Hierarchical Multiple Linear Regression in Predicting Exam Grades of Students in Introduction to Psychology Course

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ABSTRACT

We examined how psychological factors (e.g., test anxiety, sleep, and grit) and reading ability (vocabulary and spelling) along with previously measured predictors (e.g., class participation, homework, ACT Reading scores, and online learning) affect success in an Introductory Psychology course. In a hierarchical multiple linear regression model, the predictors and their interactions accounted for nearly half of the overall variance in exam grades. The model introduced test anxiety, the interactions of sleep and test anxiety, sleep and online homework, and test anxiety and ACT Reading scores, as significant contributors to exam performance.

BACKGROUND

According to MTSU's Office of Institutional Effectiveness, Planning and Research 2020 Report, the six-year graduation rate is 51.2%, meaning roughly half of students entering MTSU will not receive a degree within six years. Degree completion has been attributed to various factors surrounding psychological disorders, learning disabilities, and personal attributes. Previous studies have examined the relatively long-term effects of socio-psychological factors and reading skills on degree completion and GPA while the current study examines the more immediate, short-term relationships between mental health and reading skills on exam achievement in class.

METHOD

We used a paper survey to examine how the following factors affect success on exam grades in a sample of 160 undergraduates in an Introduction to Psychology course: the factors of test anxiety, sleep, and grit; the reading ability factors of vocabulary, spelling, and ACT Reading scores; and the previously measured class activity factors of class participation, homework, and online learning. Text anxiety was measured by the Short Test Anxiety Inventory. Sleep was assessed via the sleep/wake cycle section of the Student Sleep Health Questionnaire. Grit was measured by the Short Grit Scale. Vocabulary and spelling were assessed with the vocabulary synonym subtest and the college-level spelling subtest from the Woodcock Johnson Tests of Achievement, 4th edition.

Descriptive statistics for the sample	
Gender	
Male	70
Female	90
Other	3
Reading History	
No history of reading problems	105
Self-history of reading problems	21
Family history of reading problems	22
Native Language	
English	148

Model Fit Measures							
				Overall Model Test			
Model	R^2	Adjusted R^2	RMSE	F	df_1	df_2	p
1	0.303	0.288	51.1	20.1	3	139	<.001
2	0.406	0.379	47.1	15.5	6	136	<.001
3	0.490	0.443	43.7	10.4	12	130	<.001

Model Coefficients for Exam Predictors							
Predictor		ΔR^2	B	SE	t	p	β
Step 1		.30***					
	Classpartic		16.47	3.40	4.84	<.001	0.43
	Online Work		-0.15	0.75	-0.20	0.844	-0.02
	Homework		4.65	1.65	2.81	0.006	0.46
Step 2		.10***					
	ACT_Reading		-3.82	1.98	-1.93	0.056	-0.31
	Spelling		0.91	0.93	0.97	0.332	0.07
	Vocab		2.56	0.93	2.77	0.006	0.21
Step 3		.08***					
	STAI		-22.04	6.28	-3.51	<.001	-1.40
	SGS		-0.62	0.85	-0.73	0.468	-0.05
	SSHQ		-1.72	1.94	-0.89	0.377	-0.19
	SSHQ*Online		-0.18	0.09	-2.02	0.046	-0.42
	STAI*ACT_Reading		0.68	0.21	3.28	0.001	1.16
	STAI*SSHQ		0.39	0.15	2.63	0.010	0.60

RESULTS

Using a hierarchical multiple linear regression model, the set of predictors accounted for 49.0% of the variance in exam grades. In the first block, class participation, homework, and online learning significantly explained 30.3% of the variance in exam grades. In the second block, ACT Reading, vocabulary, and spelling were added to account for reading ability. The second block significantly explained an extra 10.3% of variance in exam grades. The third block consisted of grit, sleep, test anxiety, the interaction of sleep and learning curve, the interaction of ACT Reading and test anxiety, and the interaction of sleep and test anxiety.. The third approach significantly contributed another 8.4% of the variance in exam grades.

CONCLUSIONS

ACT reading's non-significance was unexpected because of the literature behind standardized test scores and college performance as well as the weight they hold in college entry. With the ACT Reading and test anxiety interaction, lower ability students could experience more anxiety. The interaction of sleep and the online homework activity could have potential memory consolidation effects where students who complete the online assignments and have healthier sleep patterns remember more for exams. The interaction of test anxiety and sleep could mean that higher test anxiety leads to poorer sleep behavior or vice versa. Higher test anxiety may be mediated by the effects of better sleep patterns. It is impossible to know from the current study how these interactions occur, but future studies may consider how and why these factors interact in the prediction of exam performance.

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