Journal of Contemporary Medical Education
www.scopemed.org
DOI: 10.5455/jcme.20151125020658

Short Communication

Study behaviors of health science education students seeking academic support

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Received: November 02, 2015
Accepted: November 11, 2015
Published: December 23, 2015

ABSTRACT

Objective: The literature on study behaviors of health science education students is limited. The purpose of the current study was to examine the Study Behavior Inventory (SBI) as an instrument to measure the study behaviors of this student population. **Methods:** Participants were 137 (N=137) first-year heath science education students seeking academic support services while enrolled at an academic health science center. Participants completed the SBI and grade point averages (GPA) were obtained. **Results:** Results indicated that assessing the quantity of study behaviors does not reliably measure effective learning among these students. Regression analysis indicated that the utilization of specific information resources predicted academic success. Utilization of practice questions and electronic flashcards were found to be significant positive predictors of GPA, while the use of electronic textbooks was a significant but negative predictor of GPA. **Conclusions:** Consistent with prior research, results indicated that the specific study behaviors associated with academic success were sources for self-testing. Future research will continue to examine specific study behaviors that are associated with positive academic outcomes in health science education.

KEY WORDS: Medical education; Health sciences education; Study skills; Study strategies; Self testing; Academic support

INTRODUCTION

The published literature on study strategies related to academic performance indicates the effectiveness of specific study skills such as retrieval practice, scheduling study, and distributed practice [1-4]. The medical education literature provides some additional guidance on specific study strategies related to problem-based learning [5], self-testing and time management [6], the use of practice tests [7], the use of electronic flashcards [8], and individual learning approaches [9-11]. However, research related to the academic performance of students enrolled in various other health science education programs is inadequate.

The Study Behavior Inventory (SBI) was developed to measure specific study behaviors associated with academic achievement among students in varied health science education programs [12]. The rationale for developing the instrument was to utilize the information assessed to improve the study behaviors and ultimately the academic performance of health science education students. The purpose of the current study was to continue the examination of the SBI as an appropriate instrument for understanding the study behaviors of this population of students.

METHODS

Participants

Participants were 137 (N=137) first-year heath science education students seeking academic support services while enrolled at an academic health science center in the southeastern United States. Participants' grade point averages (GPA) ranged between 0.83 and 4.0 (M=2.79; SD=.72). Additional demographics of the participants can be found in Table 1.

Table 1. Descriptive Statistics of First-Year Health Science Education Students (N = 137)

	n	%
Gender		
Female	102	75
Male	35	26
Race		
Caucasian	93	68
Black/African American	29	21
Asian	13	10
Other	2	2
Ethnicity		
Not Spanish/Hispanic/Latino	133	97
Spanish/Hispanic/Latino	4	3
School		
Medicine	37	27
Nursing	32	23
Graduate Studies in the Health Sciences	31	23
Health Related Professions	29	21
Dentistry	8	6

Instrument

The SBI was originally designed as a tool used for measuring study behaviors associated with higher academic performance among students in health science education programs. It was created based on the findings of a thorough

literature review, and it was reviewed by a panel of experts to ensure content validity. A pilot study was conducted to establish preliminary psychometrics [12], and the results supported continuing analyses based on a larger sample.

The SBI is a 48- item, self-report instrument. Its original design included two questions, which assessed the number of daily and weekly study hours, and three sections: Time Allocation (TA), Source (SO), and Study Strategies (ST). The 13-item TA section measures how an individual manages his or her time while studying, with reverse scoring for items 4, 9, and 10 (see Table 2). The 21-item SO section assesses the frequency with which an individual uses specific information resources, and the 12-item ST section measures how often an individual uses particular study strategies to learn information. The TA section utilizes a 5-point Likert scale to measure agreement (i.e., strongly disagree, uncertain, strongly agree), and the SO and ST sections utilize 5-point Likert scales to measure frequency (e.g., very rarely, occasionally, very frequently).

Procedures

Academic support services are available to all students at the institution. Services include both academic counseling and peer tutoring. First-year students requesting these services between August 2013 and May 2015 completed the SBI. Students who participated in academic counseling services completed the instrument as part of an initial learning assessment. Students who requested peer tutoring services received a recruitment email with the instrument available via an online link. Students recruited via the peer tutoring service were offered incentives (i.e., raffled gift cards) for their voluntary participation. Participants' GPAs for the semester in which the SBI was completed was collected using the institution's student information system. The study was approved by the institutional IRB.

RESULTS

Previously, a pilot study was conducted to establish preliminary psychometrics for the SBI, and the results supported continuing analyses based on a larger sample. The results of the pilot study indicated that although the SO subscale was not found to be internally consistent, there was adequate preliminary internal consistency to support the use of the TA and ST sections as separate subscales of the instrument [12]. In the current study, Cronbach's alphas for the TA, SO, and ST sections were .60, .61, and .63, respectively. These findings indicate that the items do not hang together adequately as separate subscales. These were unexpected and unanticipated results, failing to support the initial hypothesis that the quantity of studying and study behaviors positively correlate with academic success.

Table 2. Items for the Study Behavior Inventory

Time	Source	Strategy
1. I study during the morning (6 am – 11:59 am).	1. Electronic textbooks	1.Reading
2. I study during the afternoon (12 pm – 5:59 pm).	2. Printed textbooks	2.Handwriting important information
3. I study during the evening (6 pm – 11:59 pm).	3. Presentation slides provided by the instructor	3. Typing important information
4. I study during the night/early morning (12 am – 5:59 am).	4. Class lectures (attended in person)	4. Listening to an expert
5. I create a daily study plan.	5. Audio recordings/videos of class lectures	5. Studying with others
6. I maintain a schedule of all my activities.	6. Notes taken by hand or electronically	6. Attending class
7. I routinely take breaks while studying.	7. Notes taken by hand	7. Selecting main ideas
8. I take breaks after studying 1-2 hours.	8. Notes taken electronically	8. Drawing visual aids (concept maps, figures)
9. I stay up all night studying for an exam.	9. Notes taken by other students	9. Self-testing
10. I study exclusively for the next exam.	10. Transcripts of class lectures	10. Quizzing yourself as you study
11. I study consistently between exams.	11. Concept maps	11. Memorizing mnemonics (rhymes or acronyms to assist with recall)
12. When studying for exams, I begin at least 1 week in advance.	12. Figures, diagrams	12. Reciting information aloud
13. I study for more than one class per day.	13. Review books with condensed information	
	14. Practice questions	
	15. Old/past exams	
	16. Mnemonics (rhymes or acronyms to assist with recall)	
	17. Written flashcards	
	18. Electronic flashcards	
	19. Journal articles	
	20. Information found through internet searches	
	21. Apps for mobile devices	

Table 3. Regression Coefficients for the Information Sources Predicting GPA

	B	SE B	β	p
Electronic textbooks	-.135	.061	-.220	.030*
Printed textbooks	-.119	.064	-.169	.067
Presentation slides provided by the instructor	.048	.147	.030	.747
Class lectures (attended in person)	.026	.071	.039	.713
Audio recordings/videos of class lectures	-.028	.049	-.052	.578
Notes taken by hand or electronically	-.078	.087	-.103	.371
Notes taken by hand	-.018	.061	-.033	.769
Notes taken electronically	.050	.060	.093	.402
Notes taken by other students	.006	.066	.008	.932
Transcripts of class lectures	-.060	.056	-.099	.283
Concept maps	-.002	.063	-.003	.975
Figures, diagrams	.045	.066	.073	.501
Review books with condensed information	-.074	.054	-.132	.171
Practice questions	.190	.071	.276	.008**
Old/past exams	.000	.057	.000	.998
Mnemonics (rhymes or acronyms to assist with recall)	-.077	.059	-.117	.192
Written flashcards	-.082	.053	-.139	.122
Electronic flashcards	.167	.074	.252	.026*
Journal articles	.161	.103	.149	.121
Information found through internet searches	-.034	.058	-.055	.556
Apps for mobile devices	-.094	.066	-.153	.155

*p<.05; **p<.01 (2-tailed)

The findings of the present study indicate that quantifying the utilization of study behaviors does not reliably measure effective studying and is not associated with GPA, and, subsequently, cannot be used to predict academic success. In other words, more time studying, reliance on more information sources, or utilization of study strategies did not correlate with academic success and, therefore, is not the key to understanding academic performance. Based on these results, the hypothesis was restated to identify the quality of study behaviors as most important, rather than the quantity of study behaviors. Hence, an item-by-item analysis to identify possible qualities of study behaviors associated with academic success was warranted. The individual study behaviors that predicted academic success, as measured by GPA, were examined. The items were grouped together based on the three themes on which the instrument was designed (i.e., time, source, and strategy), and each group of items were entered into regression analyses to determine which items predicted GPA. Items measuring study time (see Table 2) were entered as predictors into a multiple regression using the standard method. The model was not significant: $F(13,123) = 1.33$, $p = .21$. Items measuring study strategies (see Table 2) were entered as predictors into a multiple regression using the standard method. The model was not significant: $F(12,124) = .74$, $p = .71$.

Items measuring utilization of information sources (see Table 2) were entered as predictors into a multiple regression using the standard method. A significant model emerged: $F(21,115) = 1.82$, $p = .02$. The model explains 11% of the variance in GPA (Adjusted $R^2 = .11$). Table 3 provides information about regression coefficients for the predictor variables entered into the model. The significant predictors of GPA with a positive relationship were the utilization of practice questions and electronic flashcards. The utilization of electronic textbooks was found to be a significant but negative predictor of GPA. The utilization of printed textbooks approached significance ($p = .067$) with a negative relationship to GPA but was not statistically significant.

DISCUSSION

The findings of this study indicate that the utilization of certain information resources are predictive of academic success (i.e., GPA) among first-year health science education students seeking academic support services. The use of practice questions and electronic flashcards were found to be significant positive predictors of GPA, and the utilization of electronic textbooks was found to be a significant negative predictor of GPA.

These findings support prior research indicating that practicing the retrieval of information, often called self-testing, is a highly effective approach to learning [4, 6, 13-14]. The term self-testing is used often in the literature, but

self-testing has been defined differently by many researchers. This has included free recall, questions generated by others, questions generated by self, and flashcards [8, 15-16]. The present study may shed light on the sources of self-testing that are particularly helpful for learning. For example, the terms "self-testing" and "quizzing yourself as you study" were items listed in the study strategy section of the instrument. However, neither of these items were found in the present study to be significant predictors of GPA, indicating that the terms may be too broad to adequately measure this phenomenon. Perhaps, the participants were unsure about how the terms "self-testing" or "quizzing" compared to their own study strategies. Instead, the items "practice questions" and "electronic flashcards," which were listed in the source section of the instrument, were predictive of academic success. This supports the use of these tangible sources of self-testing to improve academic performance. This also warrants future research to examine the effects of self-testing on academic performance based on concrete utilization and in real world settings.

In addition, the results of the present study indicate that use of electronic textbooks is a negative predictor of GPA. These findings support previous literature indicating that rereading textbooks is not an effective study strategy [17]. In contrast to self-testing, which is often described as actively recalling information [4], reading may take less mental effort and less retrieval effort than other study techniques [16]. Although students often report utilizing the methods of reading and rereading, they have not consistently been supported in the literature as effective study strategies, especially when compared to self-testing and other retrieval methods [17].

Although the results of this study can be generalized to students in varied health sciences education programs, this generalizability is limited due to the non-randomization of the sample. Participants were included in the study if they requested academic support services (i.e., academic counseling or peer tutoring) between August 2013 and May 2015. In addition, study behaviors were assessed via self-report, which is vulnerable to over or underestimation by the individual.

The present study indicates that assessing the quantity of study behaviors used by health science education students does not reliably measure effective studying and cannot be used to predict academic success. Consistent with prior studies, the specific study behaviors found to be most helpful were sources for self-testing. Students should consider utilizing these sources, practice questions and electronic flashcards, to learn the large volumes of fact-based information which often characterize medical education and health science education programs. Future research will continue to examine specific study behaviors that are associated with positive academic outcomes in health science education.

ACKNOWLEDGEMENTS

The authors would like to express their appreciation to Dr. James T. Johnson, behavioral sciences statistician, for his invaluable contribution to this work.

This work was partially funding by the Faculty Scholarship Exchange Award, an intramural grant award from the University of Mississippi Medical Center. The authors declare that they have no conflict of interest.

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