ORIGINAL ARTICLES

Differences in Learning and Study Strategies Inventory Scores Between Chiropractic Students With Lower and Higher Grade Point Averages*

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Purpose: This pilot study was designed to investigate the relationship between chiropractic students' learning and study strategies and academic performance. Differences in strategic learning between chiropractic students with higher grade points averages (GPAs) and those with lower GPAs have not been previously reported. **Methods:** Fifty-seven consenting first-trimester chiropractic students self-administered the Learning and Study Strategies Inventory (LASSI). Differences between high and low GPA groups were evaluated for 10 subtests and three factors using independent samples t-tests. **Results:** The high GPA group scored significantly higher ($p < .05$) on LASSI subtests Anxiety, Attitude, Concentration, Motivation, Test Strategies, and Selecting Main Ideas, and on factors Effort-Related Activities and Goal Orientation. No differences between groups were found for subtests Information Processing, Self-Testing, Study Aids, and Time Management or for the Cognitive Activities factor. **Conclusions:** The results of this study show that differences in LASSI subtest and factor scores are associated with academic performance. For the participants studied, motivational and affective aspects of strategic learning contributed to higher academic performance, whereas cognitive strategies did not. Higher performing students utilized Effort-Related and Goal Orientation learning strategies at significantly higher levels than lower performing students. The LASSI may be useful in identifying students who could benefit from learning and study skills development. Longitudinal study is recommended to investigate the effects of students' learning and study strategies on different academic content domains as well as the effects of strategic study and learning skills training on academic performance. (J Chiropr Educ 2011;25(1):5–10)

Key Indexing Terms: Chiropractic; Education; Education, Medical; Learning; Study Skills

INTRODUCTION

Academic success in higher education may be affected by many variables such as student ability, academic load, quality of instruction, prior education, and nonschool responsibilities.[1] Learning and study strategies, which are students' characteristic ways of approaching a learning task, including "thoughts, behaviors, attitudes, motivation, and beliefs related to successful learning in higher education," may also affect academic success.[1] Understanding the relationship between learning and study strategies and academic performance could help identify barriers to learning and create interventions to improve students' learning experiences.

Examining the cognitive processes, behaviors, attitudes, and motivations that contribute to strategic learning is important for improving the student learning process, curricular planning, and designing effective, performance-enhancing educational interventions. To date, few studies have focused on strategic learning in graduate health care education, with only one study performed in chiropractic education.[2] The current study investigates this understudied area. The focus of this pilot study is the relationship between academic performance

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and study and learning strategies including ability to concentrate, level of anxiety, time management, motivation, attitude, study skills, and test-taking skills. This study was designed to identify which learning and study strategies are related to student success and which strategies distinguish between higher and lower performers in chiropractic education.

The Learning and Study Strategies Inventory[3] (LASSI) was selected to measure learning and study strategies. The LASSI is a widely utilized instrument for assessing aspects of strategic learning in higher education and has demonstrated good reliability and validity.[4,5] The LASSI has been used at more than 2274 academic institutions according to the LASSI publishers.[3] LASSI subtests have been demonstrated to be generalizable to different populations in higher education, including undergraduates,[4-6] pharmacy students,[7] and medical students.[8,9] Cano's recent in-depth analysis[10] concludes that the LASSI remains an understudied instrument and more research is needed on its psychometric properties.

Several studies have investigated the relationship between LASSI subtest scores and various indicators of academic performance.[10-12] Significant relationships have been demonstrated between LASSI subtest scores and grade point average[7] (GPA), national exam performance,[2] and online course performance.[13] Previous studies of undergraduates have demonstrated that higher performing students score higher on most or all of the LASSI subtests,[4,6] while the few studies of health care/graduate students have found mixed results on these relationships.[2,7-9]

Sleight and Mavis[9] examined LASSI subtest scores on a sample of 96 2nd-year medical students divided into low, medium, and high cohorts based on MCAT scores. The bottom cohort had the lowest scores and the top cohort had the highest scores on the Motivation and Concentration subtests. Interestingly, the highest scoring cohort scored lower on Study Aids than the lower scoring groups. Other subtests were not significantly different between the groups.

In a study with pharmacy students,[7] both the LASSI subtest scores and the three factors proposed by the LASSI designers (ie, Skill, Will, and Self-Regulation) were evaluated. The LASSI did not contribute significantly to regression models over and above pre-pharmacy math/science GPA and Pharmacy College Admission Test (PCAT) for predicting 1st-year pharmacy GPA. However, the subtests Motivation, Anxiety, Concentration, Selecting Main Ideas, and Test Strategies had significant positive correlations with 1st-year GPA.[7]

In the only other study with chiropractic student subjects, Pringle and Lee[2] compared LASSI subtest scores for sixth-trimester chiropractic students to scores on the Part I National Board of Chiropractic Exam (NBCE) as well as entering and cumulative GPAs. Moderately high correlations were found between all of the LASSI subtest scores and NBCE scores and cumulative GPA.[2]

The designers of the LASSI, Weinstein et al,[14] proposed three factors of strategic learning represented by the subtests of the LASSI: Skill (Information Processing, Selecting Main Ideas, and Test Strategies), Will (Anxiety, Attitude, and Motivation), and Self-Regulation (Concentration, Self-Testing, Study Aids, and Time Management). Subsequent factor analytic studies have found different combinations of subtests for the factors to be a better fit for their data.[10,11,15]

Olejnick and Nist,[15] using the LASSI on two separate samples of American undergraduates, grouped the subtests into the following factors: Effort-Related Activities (Motivation, Time Management, and Concentration), Cognitive Activities (Information Processing, Study Aids, and Self-Testing), and Goal Orientation (Anxiety, Selecting Main Ideas, and Test Strategies). Olaussen and Braten[11] utilized two samples of Norwegian college students and found a similar structure to Olejnick and Nist,[15] with the exception of adding the subtest of Attitude to the Effort-Related Activities factor.

Most recently, Cano[10] examined the latent structure of the LASSI using college freshmen and identified three factors: Affective Strategies, Comprehension Monitoring Strategies, and Goal Strategies. Cano's findings supported and extended Olaussen and Braten's[11] research. Two of Cano's factors, Affective Strategies and Goal Strategies, were positively related to academic performance. Cano concluded that the LASSI is a complex and useful instrument that is related to academic performance and that more research is needed to explore the potential uses of the LASSI subtests for understanding learning motives and strategies.

The current pilot study evaluated the differences between lower and higher academically performing first-trimester chiropractic students on the 10 LASSI subtests and three primary factors as first proposed by Olejnick & Nist.[15] The first factor, Effort-Related Activities, included the subtests Time Management,

Motivation, Concentration, and Attitude. The second factor, Goal Orientation, included Anxiety, Test Strategies, and Selecting Main Ideas. The third factor, Cognitive Activities, consisted of Information Processing, Self-Testing, and Study Aids. Based on previous research, it was hypothesized that higher performing students will have significantly higher ($p < .05$) LASSI subtest scores than lower performing students, and higher performing students will have significantly higher ($p < .05$) scores on the three LASSI factors than lower performing students.

METHODS

Design

This observational pilot study was approved by the Logan Chiropractic College Institutional Review Board.

Subjects

Fifty-seven consenting volunteer students were recruited from the Spring Trimester 1 class at Logan Chiropractic College. The average age of the 21 female and 26 male participants was 24 years (SD = 4.21). The mean cumulative GPA for this sample was 2.92 (SD = .74), based on grades for the Doctor of Chiropractic degree program at the end of trimester 1.

Two groups were formed from the distribution of GPAs in the sample, bifurcating at the median GPA of 3.01. The lower GPA group (LGPA) ($n = 28$) ranged from 1.29 to 3.00 with a mean of 2.29 (SD = .52). The higher GPA group (HGPA) ($n = 29$) ranged from 3.01 to 3.94 with a mean of 3.54 (SD = .27).

Instrumentation

The LASSI[14] is a self-administered and scored assessment instrument consisting of an 80-item, 10-subtest questionnaire using a 5-point Likert scale. Each of the 10 subtests of the LASSI is comprised of 8 items. The labels on the choices refer to the degree to which a statement is perceived as typical of the respondent with 5 representing the highest ("very much typical of me") to the lowest ("not at all typical of me") degree of agreement. Only the Anxiety subtest is reversed scored, meaning that the

higher the score, the less anxiety is reported by the subject.

The LASSI also provides national normative data for each of the LASSI subtests. The mean scores comprising the final version of the statistics utilized for the subtest norms ranged from 25.52 to 29.13.[1]

Procedure

Subjects signed consent forms, received instructions, and then completed the LASSI in one class period during the 3rd week of trimester 1. The standard administration of the LASSI, which includes student access to their respective scores, was utilized. To ensure consistency, the tests were scored by trained data analysts and returned to the students in confidential envelopes the following week. Enclosed with the test results was a letter outlining several ways to improve their scores with the help of the Student Services Department. Subjects' GPAs were obtained from the transcript record database by authorized Student Services personnel. All data collected and compiled were verified by both principal investigators.

Data Analysis

Standard deviations and means were calculated for each of the LASSI's 10 subtests and the three factors of Effort Related Activities, Goal Orientation, and Cognitive Activities. The means of the three factors were calculated by averaging the respective subtest scores, which were combined into each factor. Data were analyzed by t-test, because it is a powerful and conservative statistical test and the distributional assumptions were met. One-tail independent sample t-tests were performed comparing the LGPA and HGPA groups for the 10 subtests and 3 factors. Independent sample t-tests were performed comparing male and female subjects.

RESULTS

LASSI Subtest Scores and GPA

Descriptive statistics and t-tests for the LASSI subtest scores for LGPA and HGPA groups are shown in Table 1. Significant differences were found between LGPA and HGPA groups on six subtests: Anxiety, Attitude, Concentration, Motivation, Test

Table 1. LASSI subtest descriptive statistics and *t*-tests for lower and higher GPA groups

LASSI Subtest	Lower GPA (n = 28)		Higher GPA (n = 29)		df	t	p
	Mean	SD	Mean	SD			
ANX	26.22	8.46	30.73	6.33	55	−2.29	.012*
ATT	33.33	3.45	34.93	2.84	55	−1.92	.030*
CON	26.00	4.95	28.8	5.86	55	−1.94	.029*
INP	30.26	4.91	29.13	4.19	55	−0.95	.172
MOT	32.04	3.52	34.37	4.11	55	−2.29	.013*
SFT	24.63	5.86	25.40	6.24	55	−0.48	.317
SMI	27.89	4.56	32.13	5.27	55	−3.23	.001**
STA	25.70	4.23	25.40	6.32	55	0.21	.417
TMT	24.81	4.98	27.10	5.82	55	−1.58	.059
TST	28.63	4.57	32.13	3.89	55	−3.12	.001**

Note: Lower GPA = 1.29–3.00; higher GPA = 3.01–3.94. ANX, Anxiety; ATT, Attitude; CON, Concentration; INP, Information Processing; MOT, Motivation; SFT, Self-Testing; SMI, Selecting Main Ideas; STA, Study Aids; TMT, Time Management; TST, Test Strategies.
*$p < .05$; **$p < .01$.

Table 2. LASSI factors descriptive statistics and *t*-tests for lower and higher GPA groups

LASSI Factor	Lower GPA (n = 28)		Higher GPA (n = 29)		df	t	p
	Mean	SD	Mean	SD			
Effort-Related Activities	29.05	3.20	31.30	3.46	55	−2.54	.006**
Goal Orientation	27.58	5.06	31.67	4.46	55	−3.24	.001**
Cognitive Strategies	26.86	3.98	26.64	4.17	55	0.20	.420

Note: Lower GPA = 1.29–3.00; higher GPA = 3.01–3.94.
**$p < .01$.

Strategies, and Selecting Main Ideas. No significant differences were found between the two groups on four subtests: Information Processing, Self-Testing, Study Aids, and Time Management. The differences found in the means of the LPGA and HGPA groups were similar to that of lower and higher performing groups measured by other researchers.[4] Subtest gender differences were previously cited in the literature,[16] but no significant gender differences were found on the subtests in the current sample.

LASSI Factor Scores and GPA

Descriptive statistics and *t*-tests for the LASSI factor scores for LGPA and HGPA groups are shown in Table 2. Significant differences were found between the LGPA and HGPA groups on Effort-Related Activities and Goal Orientation. No significant differences were found between the two groups on Cognitive Activities.

DISCUSSION

The findings of this study show that there were statistically significant differences between higher and lower performing first-trimester chiropractic students in their learning and study strategies. The results of the LASSI subtests and the three factors for the LGPA and HGPA group students mostly supported this study's hypotheses and agreed with a consensus of findings from previous studies.[6,8] For the participants in this study, subtest scores for Anxiety, Attitude, Motivation, Concentration, Selecting Main Ideas, and Test Strategies were significantly higher for the HGPA group students, which agrees with the study on 1st-year pharmacy students[7] and the study on chiropractic students.[2] As shown in Cano's study,[10] the results for two factors, Effort-Related Activities and Goal Orientation, were significantly higher for higher performing students, which suggests that motivation and attitude

are related to successful learning in a Doctor of Chiropractic educational program. The finding that the Cognitive Activities factor was no different between the HGPA and LGPA groups agrees with the findings of both Cano[10] and Sleight and Mavis,[9] who also found that Study Aids were utilized less by the higher grade point average students.[8]

The results from this and other studies collectively suggest that strategic learning is an important factor in academic success. This also suggests that educational interventions and curriculum changes designed to improve strategic learning might improve the academic success of lower performing students. Improving the overall learning experience and academic performance of chiropractic students could reduce course failures, thus enhancing student retention and graduation rates. These possibilities warrant further investigation.

Limitations of this study include that LASSI scores are self-evaluations, which may reflect biased self-perceptions. Self-perceptions do not always match with behaviors. Therefore, further studies need to examine whether or not lower performing students utilize test-taking strategies or selecting main ideas at lower levels than the higher performing students. As a self-report and self-scored instrument, the LASSI introduces the possible confounding factor of students' receiving their normative scores, which may affect their resulting academic performance outcome measures. Perhaps knowing their scores served as an intervention for the students as well as a measure of their self-perceptions. Finally, the population utilized in this study may have unique characteristics that could limit generalizability.

CONCLUSION

For the participants studied, attitudinal and motivational aspects of strategic learning were significantly higher for HGPA versus LGPA first-trimester chiropractic students. These findings suggest that the LASSI may be useful for evaluating learning and study skills strategies and for identifying chiropractic students who could benefit from learning and study skills training. Effort-Related Activities, Goal Orientation, and Cognitive Activities appear to be useful LASSI subtest groupings (factors) in relation to academic performance for first-trimester chiropractic students. Further study is recommended to investigate the effects of students' learning and study strategies on different academic content domains, learning and study skills changes over time, and the effects of strategic study skills training on academic performance.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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