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How to Identify At-Risk Medical Students based on Learning Style, Personality Indicator and Learning Strategy Tests – a Mixed Method for a Pilot Study

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Abstract

The number of students experiencing academic difficulty continues to be a prevalent and serious issue among medical schools worldwide. While some studies have investigated the causes of underperformance, none have identified markers of “at-risk” students. This study used three diagnostic tests to determine possible identifying characteristics of students performing at different levels. Our results indicate that students with a Diverging learning style may struggle in medical school and need to be

guided toward a learning style that is more suitable to their career paths. Learning and Study Strategies Inventory (LASSI) reveals that low performing students need assistance honing their test-taking and self-assessment skills. This test can be a good complement to the Kolb Learning Style Inventory (LSI). In order to promote the academic success of medical students, adequate diagnostic tests should be utilized upon the students' matriculation to assist in finding their learning styles, strengths, and weaknesses. Thereafter, a combination of study skills, test-taking strategies and time management learning tools should be provided to those identified to be "at risk" academically, in order to increase their chances of success.

Introduction

Despite medical schools' efforts to admit only students whom they believe meet the criteria necessary for academic success as indicated by their GPAs, MCAT scores, personal interviews and other various standards, a percentage of matriculated medical students will inevitably struggle.^{1,2} These "at-risk" students then become in danger of failing one or more courses, or of withdrawal or dismissal from medical school, due to academic underperformance.^{3,4} Clearly, the current selection criteria are not sufficient to avoid this difficulty. Therefore, it is necessary to find other indicators or markers of potential academic performance in order to identify "at-risk" students as soon as they matriculate, rather than await the results of the first set of exams.²

Early intervention for remediation is a vital process within institutions where there is no option of a decelerated curriculum, as failure may eventually lead to dismissal.^{5,6}

Several studies have investigated the causes of underperformance or academic failure by undergraduate medical students.^{3,4,7-10} However, none have listed academic markers or identifiers of “at-risk” students, nor suggested effective ways to remediate them at any level of medical education or training.

Therefore, this study has analyzed the results of the learning styles and diagnostic tests taken by students performing at different levels of medical education at Touro University Nevada (TUN). These diagnostic tests were administered in order to elucidate the dissimilitude of characteristics, aptitudes, and learning styles among students at different levels of performance, thereby serving as markers of “at-risk” students.¹¹⁻¹⁴

Although the sample of students participating in this study is too small to have any significant statistical value, its results as a pilot study may lead to a larger undertaking to verify whether there is a real correlation between the predictions of the diagnostic tests and student performance at least in the first two years of medical school.

Study Design and Methods

Institutional Review Board Approval and Consent Form

The research proposal was approved by the Institutional Review Board (IRB) after a full review. A consent form was drawn up by the principal investigator (PI) explaining the goals of the study. Each participant received a copy prior to participation and was given time to read and sign the form before getting involved in this project.

The diagnostic test reports were coded by the PI in order to keep the identity of the participants anonymous. All collaborators in this project received the adequate training to work with human subjects and learned how to handle personal information, thereby conforming to the rules and regulations of the Family Educational Rights and Privacy Act (FERPA).

Recruitment and Sample

Using the email system of the institution, a call for participation message was sent during the spring semester of the 2010-2011 school year to all osteopathic medical students from all four years of undergraduate medical education. From all the respondents, a cohort was created to include nine students from each year, consisting of three high-performing students (HPS), three medium-performing students (MPS), and three low-performing students (LPS), resulting in a sample of 36 participants.

The differentiation among academic performance levels was based on GPA at the end of each academic year and was categorized as follows: high-performing (4.0-3.5 GPA), medium-performing (3.45-3.0 GPA) and low-performing (2.9-2.0 GPA).

Diagnostic Tests to Discriminate among Students of Different Performance Levels

In order to determine the characteristics of students based on their study skills and psychological traits at different levels of academic performance, three different tests were selected. For convenience, the participants were given the opportunity to take the

diagnostic tests online. Each test supplier provided a complete and specific report for each participant.

Kolb Learning Style Inventory (LSI)

This test assists in determining each student's learning style among the four distinct types which include Assimilating, Accommodating, Diverging, and Converging.

According to Kolb's theory, these styles are based on a four-stage "learning or training cycle."¹⁵ This test offers both a way to understand different learning styles and a way to explain a cycle of experiential learning that applies to all learners.

Learning and Study Strategies Inventory (LASSI)

This test is both diagnostic and prescriptive. It identifies the strengths and weaknesses of a given student and provides feedback about areas where a student should be assisted in improving through educational interventions.¹⁶ These areas, or scales, include Selecting Main Ideas (SMI), Test Strategies (TST), Information Processing (INP), Motivation (MOT), Anxiety (ANX), Attitude (ATT), Time Management (TMT), Study Aids (STA), Self-Testing (SFT), and Concentration (CON). Each of the above scales contributes to either the Skill, Will, or Self-regulation components of strategic learning within LASSI.

Myers-Briggs Type Indicator (MBTI)

MBTI is a personality inventory, the purpose of which is to understand the variation in students' behavior based on preferences in the use of perception and judgment.

According to this theory, differences in perception lead to differences in conclusions reached and consequently, differences in interests, reactions, values, motivations, and skills.¹⁷

The MBTI Preferences are categorized into Extraversion (E) or Introversion (I), Sensing (S) or Intuition (N), Thinking (T) or Feeling (F), and Judging (J) or Perceiving (P). The personality type is then determined by the combination of preferences, which results in 16 possible MBTI personality types.

Results and Discussion

Kolb Learning Style Inventory (LSI)

The majority of the HPS had an Assimilating learning style, which is characterized by the LSI as being suitable for careers in science and research (Figure 1). The majority of MPS had an Accommodating learning style, which is characterized as being suitable for careers in teaching, marketing and sales. The majority of LPS had a Diverging learning style, which is characterized as being suitable for careers in the arts. The learning style characterized by the LSI as being suitable for careers in medicine is Converging. A student with a Diverging learning style may have difficulty in medical school and needs to acquire elements of a learning style more suitable to medical school such as those that characterize Assimilating or Converging learning styles.

Learning and Study Strategies Inventory (LASSI)

According to LASSI, students who score above the 75th percentile within a particular scale tend to have a good grasp of the skill or strategy being evaluated and typically do not need to improve it. Students who score within the 50th-75th percentile should consider improving that skill or strategy, and students who score below the 50th percentile definitely need to improve that skill or strategy.¹⁶ Figure 2a shows that the highest number of LPS lack test-taking skills and self-assessment abilities.

Figure 2b depicts those students who scored above the 75th percentile. HPS seem to be skilled in studying techniques and testing strategies and are highly motivated. LPS seem to lack motivation and self-testing methods and need to improve studying techniques and test strategies, yet have a better attitude about their educational goals.

This tool, in conjunction with the LSI, could be a very good diagnostic tool, allowing for discrimination between students based on their learned or innate abilities.

Myers-Briggs Type Indicator (MBTI)

The results show a wide range of personality types among all participants. Overall, the test could not identify at-risk students because LPS did not have a common personality type (Figure 3). MBTI may not be the best diagnostic test to be used in order to discriminate among students of different performance levels.

In an effort to further evaluate possible discriminating factors by use of the MBTI, we analyzed trends among the individual traits (Extraversion vs. Introversion, Sensing vs. Intuition, Thinking vs. Feeling and Judging vs. Perceiving) that make up the personality types (Figure 4). LPS tend to be Extraverts who process information by Intuition. Among HPS and MPS there was a greater tendency to make decisions by Thinking rather than Feeling. Again, the MBTI does not seem to be a very useful diagnostic tool, as it did not reveal any telling commonalities.

Discussion

Some learning styles seem to be predictive of the level of performance in medical school. Namely, those students with Converging, Assimilating and Accommodating learning styles should do well, while students with Diverging learning styles may need assistance if they are to succeed in medical school. The additional advantage of the LSI is that it is designed to help expand upon students' learning strengths and encourages acquisition of other learning styles. According to the Kolb theory, one does not have to be stagnant in the learning style that he or she tends to favor. Appropriate training and education should allow each of us to move through the learning cycle in order to develop the learning style that better suits our target career.¹⁵ Therefore, with workshops and specifically designed short courses, a medical student with a Diverging learning style can acquire the necessary attributes for an Assimilating or a Converging learning style.

Since the LASSI reveals both strengths and weaknesses, it would be a good complement to the LSI. LASSI specifically reveals students' strengths and weaknesses in Testing and Studying methods, which are essential skills in an educational environment where knowledge is tested by multiple-choice question exams. After using LSI to determine the learning style and LASSI to delineate the strengths and weaknesses, a student with a Diverging learning style and a combination of weaknesses in skill, will and self-regulation aptitudes should be given the tools to acquire a better learning style for their chosen careers and provided with educational training workshops to acquire skills they lack.

Overall, LPS need academic guidance and support in Study and Time Management skills to ensure their success. Implementing an effective mentoring program will also aid as an avenue of guidance throughout medical school.

Early identification of "at-risk" students or LPS is essential for academic intervention. Administering the recommended diagnostic tests would be best within the orientation week to allow for proactive actions to provide "at-risk" students with the tools necessary for success in medical school. As indicated by Kolb, developing a new learning style and becoming a flexible learner require hard work over a long period of time to see improvement. This endeavor necessitates a) developing relationships with people whose learning styles are different from one's own but more suitable for medical school, b) improving the fit between the learning style and the demands of medical school, and

c) making efforts to learn in ways that are sometimes opposite of the current preferences.

Early detection and intervention will maximize time for development of the necessary skills, thus maximizing students' potential for success and reducing their risk of becoming LPS.

In order to advance the potential of this study's findings, it is necessary to investigate successful intervention programs that are currently in place at other medical schools. While the small sample size is a limitation, the apparent value of these measures warrants further study. Analyzing the performance on several disciplines of the whole class during the first two years of medical school and adding other parameters such as MCAT scores and incoming GPA might further strengthen the predictive value of the above mentioned tests and should be explored.

Conclusion

Based on the results of the diagnostic tests, the LSI and the LASSI appear to be good indicators of student performance and thusly good markers for identification of "at-risk" students.

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Figure 1: The majority of HPS, MPS and LPS had an Assimilating, Accommodating and Diverging learning style, respectively.

Figure 2a: The largest number of LPS needed improvement in the area of Test Strategies and Self-assessment. Selecting Main Ideas (SMI), Test Strategies (TST), Information Processing (INP), Motivation (MOT), Anxiety (ANX), Attitude (ATT), Time Management (TMT), Study Aids (STA), Self-Testing (SFT), and Concentration (CON). Each of the above scales contributes to either the Skill, Will, or Self-regulation components of strategic learning within LASSI.

Figure 2b: A greater number of HPS scored above the 75th percentile in the ability to Select Main Ideas, in their Test Strategies, Motivation, use of Study Aids and Self-Testing, than did LPS.

Figure 3: Among HPS, 33% had an ISTP personality type. Among the MPS, 57% had an ISTJ personality type. The personality types of the rest of the students among all performance levels were evenly distributed. Extraversion, Intuition, Feeling, Judging (ENFJ); Extraversion, Intuition, Feeling, Perceiving (ENFP); Extraversion, Intuition, Thinking, Judging (ENTJ); Extraversion, Intuition, Thinking, Perceiving (ENTP); Extraversion, Sensing, Feeling, Judging (ESFJ); Extraversion, Sensing, Feeling, Perceiving (ESFP); Extraversion Sensing, Thinking, Judging (ESTJ); Extraversion, Sensing, Thinking, Perceiving (ESTP); Introversion, Intuition, Feeling, Judging (INFJ); Introversion, Intuition, Feeling, Perceiving (INFP); Introversion, Intuition, Thinking, Judging (INTJ); Introversion, Intuition, Thinking, Perceiving (INTP); Introversion, Sensing, Feeling Judging (ISFJ); Introversion, Sensing, Feeling, Perceiving (ISFP); Introversion, Sensing, Thinking, Judging (ISFP); Introversion, Sensing, Thinking,

Perceiving (ISTP); Learning and Study Strategies Inventory (LASSI); Myers-Briggs Type Indicator (MBTI)

Figure 4: HPS and MPS tend to make decisions by Thinking. LPS tend to be Extraverts who process information by Intuition.