LEARNING STYLES OF UNDERGRADUATE ATHLETIC TRAINING STUDENTS IN A CAATE-ACCREDITED ATHLETIC TRAINING EDUCATION PROGRAM

by

Alyssa D. Reyes

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Alyssa D. Reyes

Approved: _____
Thomas W. Kaminski, Ph.D., ATC, FNATA, FACSM
Professor in charge of thesis on behalf of the Advisory Committee

Approved: _____
William B. Farquhar, Ph.D.
Chair of the Department of Kinesiology and Applied Physiology

Approved: _____
Kathleen S. Matt, Ph.D.
Dean of the College of Health Sciences

Approved: _____
James G. Richards, Ph.D.
Vice Provost for Graduate and Professional Education

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ABSTRACT

Context: Assessing learning styles of athletic training (AT) students may assist educators in enhancing their student's educational experience. **Objective:** To identify learning styles of undergraduate AT students and determine if a specific learning ability translates into program admission acceptance and success on the Board of Certification (BOC) examination for athletic trainers. **Design:** Prospective, cohort. **Setting:** Classroom. **Participants:** Three hundred and fifteen (110M, 205F) AT students (18-25yrs.) between 2004-2012 were tested. All students were enrolled (or seeking enrollment) in a CAATE accredited athletic training education program (ATEP) at a mid-sized Division-I institution. **Intervention:** The Kolb Learning Style Inventory (LSI) is a 12-question survey that indicates our preferred approach to learning in everyday life. Athletic Training Interest (ATI) students are administered the LSI annually. Students accepted into the program repeated the LSI during their final year in the ATEP. BOC exam pass/fail rates were collected from students after graduation. **Main Outcome Measures:** Concrete experience (CE), active experimentation (AE), reflective observation (RO), and abstract conceptualization (AC) learning abilities were compared to program admission (yes/no) and success on BOC exam (pass/fail). Indicators of learning style were also derived. Logistic regression analysis was performed to determine if learning ability (CE, AE, RO, AC) predicted admission into the ATEP and success on the BOC exam. **Results:** The preferred learning style pre-ATEP admission was accommodator, while the preferred style of ATEP students in their final year was

converger. The four learning abilities predicted admission into the ATEP ($x^2 = 18.622$, df = 4, $p = .001$); however they failed to predict outcome on the BOC exam ($x^2 = 2.653$, df = 4, $p = .617$). Learning abilities CE (p = .04) and RO (p = .008) had the greatest effect on predicting ATEP admission. **Conclusions:** AT students have a broad range of learning styles which create challenges for educators. Admission success in this cohort of AT students is best predicted from those displaying the CE and RO learning abilities. Conversely, none of the learning abilities predicted BOC exam outcome.

Key Words: Prediction, Health Education, Instruction, BOC Exam

Chapter 1

INTRODUCTION

Of late, there is considerable discussion as to the future direction of athletic training education. Every profession's base begins with its students and educational foundation. Success in the education of a profession's students not only leads to better prepared entry-level professionals, but also overall growth in the strength and determination of students to continue to better the profession with their lifelong learning skills.

The first step in educating future professionals is retaining students in the educational programs and encouraging them to continue into the workforce. A study by Mazerolle et al. found that only 82.4% of recent athletic training graduates actually pursue a career in athletic training.[1] Good mentoring during an undergraduate career as an athletic training student can help reinforce professional roles, advance skill development, and promote lifelong learning.[1] Excellent guidance and teaching that focuses on the student's needs not only prepares them for success in the education program but also encourages them to develop strong learning skills, communication talents, and successful professional relationships. Bowman et al. stated that educators must work to present the athletic training field as *exciting* and *dynamic* in order to maintain the student's interest in the curriculum.[2] Young et al. examined student retention in ATEPs and reported that students wanted to have "hands-on", real-world experiences in athletic training; which in turn translated into retention.[3] This not only

increases self confidence in their abilities, but also keeps them engaged in the program and driven to succeed. Observation and "hands-on" experiences during clinical rotations provide students with meaningful, authentic learning experiences that enhance their education.[3]

The Athletic Training Education Competencies – 5th Edition encourages accredited athletic training education programs to employ innovative, student-centered teaching and learning methodologies to connect the classroom, laboratory and clinical settings whenever possible to enhance professional preparation.[4] One of the first steps in increasing retention of knowledge is to understand how each specific student learns and retains information most effectively. Nelson and colleagues were interested in examining if an intervention based on learning preferences increased student academic achievement and retention.[5] They used the Productivity and Environmental Preference Survey (PEPS) to analyze student preferences in their learning environment. They indicated that when students are provided with a method of studying based on their learning preference, academic achievement improved.[5] Ones learning style provides the rational to adopt new teaching techniques with the goal of maximizing achievement based on each student's unique traits.[5]

Athletic training educators are continuously seeking ways to improve the selection of students into their programs as well as boost Board of Certification (BOC) certification examination success. Educators may utilize information gleaned from the assessment of student learning styles as a measure of retention and success in careers as athletic trainers. Examining learning styles of potential athletic training program students

may assist program directors in the admission/selection process by providing them with another component of a student's learning strengths and weaknesses.

The NATA Executive Committee for Education stated that acquisition and clinical application of knowledge and skills in an education program must represent a defined yet flexible program of study.[4] Educators that continue to re-evaluate the effectiveness of their curriculum, and utilize learning preferences as a basis to move in new directions, may indeed benefit from improvements in student retention and maximization of student learning. These actions may increase current student absorption of knowledge and continue to positively influence new students that filter through the program.

The purpose of our study was to identify the learning styles of undergraduate athletic training students at a large mid-Atlantic university and to evaluate how these learning styles relate to gaining admission into our athletic training education program (ATEP) and success on the BOC examination for athletic trainers. We also evaluated the test-retest reliability of the Kolb Learning Styles Inventory (LSI).[6] We hypothesized that a dominant learning style or ability would emerge in those that gained admission into the ATEP and that there would *not* be a dominant learning ability that predicted success on the BOC exam on the first try.

Chapter 2

MATERIALS AND METHODS

2.1 Participants

A total of 315 (110M, 205F) from the University of Delaware's ATEP were enrolled in this study. The students ranged in age from 18-25 years old. The ATEP is accredited by the Commission on the Accreditation of Athletic Training Education (CAATE).

2.2 Instrumentation

A learning style assessment can be achieved using many different instruments. Previous research on learning styles have used the Kolb Learning Style Inventory (LSI)[7-11], the Productivity Environmental Preference Survey (PEPS)[12,13], Gregorc Mind Styles[14,15], and the Babich and Randol LSI[16]. For this study we used the Kolb LSI because of its established reliability and validity.[11,12,17]

The basis for utilizing the Kolb LSI for our study originates from David A. Kolb's Experiential Learning Theory.[18] His theory is strongly linked to the fact that people experience learning purposefully, as opposed to learning by a process out of conscious control. Kolb's theory centers around the learning abilities he feels every person should possess in order to be a well-rounded learner. These abilities include: concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE). The abilities fall into a category of either a "concrete" or "abstract" learning process. The concrete stage of learning is experienced through motor

and sensory inputs like touching, feeling, and handling. Along with concrete experience, comes an active type of involvement in learning, or active experimentation. The student is actively involved in the learning environment by taking full advantage of their sensorimotor systems. This type of learning would most likely occur during clinical rotations or laboratory settings in an ATEP. The abstract conceptualization method of learning is more focused on concentrating on concepts and theories. During the abstract phase of learning a student also has a reflective phase or observation phase. This is when the student can use what they have gained through abstract learning and hypothesize or draw conclusions with the information. This type of experiential learning would most likely occur in the classroom setting in an ATEP.[18]

The four learning abilities translate into four learning styles. Learning styles are the combination of two dominant learning abilities. Kolb's theory presents four types of learning styles: diverger, converger, assimilator, and accommodator. A diverger combines the abilities concrete experience (CE) and reflective observation (RO) as their dominant learning abilities. The diverger learner would be able to take their concrete experiences and use them to brainstorm and generalize. These types of learners like to work in groups and are more imaginative and creative than others. An assimilator's dominant learning abilities are abstract conceptualization (AC) and reflective observation (RO). Assimilators work better with logical reasoning and thinking about ideas over time. These types of learners also prefer readings where they can intake the information and take their time absorbing it. Convergers have the dominant learning abilities of abstract conceptualization (AC) and active experimentation (AE). These types of learners are problem solvers. They like to take their thoughts and ideas and apply them

to situations that need a solution. Convergers mostly focus on practical applications of their knowledge. The last learning style, an accommodator, uses the dominant learning abilities of concrete experience (CE) and active experimentation (AE). Accommodators learn best with hands on experience. These types of learners would rather gain information from others versus formulating their own conclusions, and therefore tend to work better in groups.[6,18,19]

The specific traits found in each of the learning styles can help determine which professions students might excel in. The assimilators and convergers, who prefer abstract ideas and concepts, work better with technical tasks and problems with social interactions. Therefore these types of learners might be better suited in information, science, and technology careers. Accommodators and divergers on the other hand, prefer hands-on experiences and concrete ideas; and might be best in the arts, entertainment, and marketing/sales careers.[18]

Kolb's experiential theory is based on the idea that thoughts are formed and transformed over time. No experience is similar to any other and all of a person's experiences shape what they learn differently at various times in their life. This generally describes how an ATEP works to effectively educate its students. ATEPs function over the student's educational career to continually reinforce skills needed to be an efficient, well-rounded entry-level athletic trainer. Students in an ATEP are continually taught and tested multiple times on fundamentals throughout their tenure. Kolb's theory relates to this practice because every time a student learns, or relearns proficiencies, they are reshaping and reinforcing that experience.[6]

The Kolb LSI is a series of twelve, four part questions. For each part of the question, the student ranks them from one to four, one being "least like me" and four being "most like me". After the student is done ranking each question, the scores are totaled in the four categories. These four scores represent the student's preference for each of the learning abilities or modes. Responses to each of the 12 questions are placed into columns. Column 1 represents the score for *concrete experience (CE)*, column 2 *reflective observation (RO)*, column 3 *abstract conceptualization (AC)*, and column 4 *active experimentation (AE)*. These scores are then plotted on Kolb's cycle of learning. Lines can be drawn to the x and y-axis from the plotted scores to show the strength of the relationship between the two learning abilities. Once the scores are plotted, and lines drawn, it becomes prevalent which learning style is the student's dominant style. The further the score is from the center of the circle, the more profoundly a student relies on those abilities to learn.[6,18,19]

2.3 Procedure

Athletic training interest (ATI) students are administered the Kolb LSI as part of their routine orientation activities on an annual basis. The majority of the students are freshman (1st year) students. The ATI students who were formally accepted into the ATEP and matriculated through the formal program were then asked to repeat the Kolb LSI during the Fall semester of their final year (senior) in the program. The Kolb LSI requires approximately 15 minutes to complete.

Additionally, students in their final year in the program sit for the BOC examination for athletic trainers before or immediately after graduating. Reporting their

score (pass vs. fail) to the ATEP Director upon being notified shortly after the examination has been completed was also required as part of this study.

2.4 Data Analysis

One goal of the investigation was to examine the validity and reliability of the Kolb LSI. Validity was assessed using two direct-entry (standard), binary logistic regression analyses. The response (i.e., dependent) variable for the first analysis was passing the BOC exam on the 1st try. The value "1" represented a passing grade and "0" denoted failure. Consequently, the first analysis predicted the outcome of passing inasmuch as logistic regression analyses always predict the "1" value of a response variable.[20,21] The response variable for the second analysis gaining admission to the ATEP**,** where the value "1" represented a gaining admission and "0" denoted not being admitted. Four explanatory (i.e., independent) variable were employed for each logistic analysis: CE, RO, AC, and AE. All four variables were on the interval scale of measurement. A probability level of $P \leq .05$ was set to determine statistical significance for all tests.

We were interested in examining the stability of the learning ability scores in the cohort of students who took the test prior to gaining admission in the ATEP and who were ultimately successful and then took the Kolb LSI again in the final year. Therefore, reliability was examined by computing test-retest reliability coefficients for the following four scores: Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE). An associated correlation coefficient of $r = .70$ was expected for the test-retest reliability of Kolb's four learning abilities.

Chapter 3

RESULTS

Table 1 presents frequency counts and percentages for the categorical variables of overall learning style during the first and second years of testing, BOC exam outcome on the 1st try, and ATEP admission status.

Table 2 presents distributional statistics (mean [*M*]s, standard deviation [*SD*]s) for the interval level variables of CE, RO, AC, and AE scores obtained at time 1 and at time 2. The means and standard deviations for each of the learning abilities during the first year were fairly consistent, except for the active experimentation (AE) ability. AE during the first year of testing had a mean(SD) of 37.4(6.6), while the other learning abilities' means(SD) were all in the high 20s: CE 25.7(6.8), RO 29.8(6.8), and AC 28.6(6.9) (Table 2). The means and standard deviations for each of the learning abilities during the second year of testing were also fairly consistent, aside from the active experimentation learning ability. The mean(SD) of AE was significantly higher at 38.3(6.2), while the means(SD) for the other abilities were CE 22.7(6.6), RO 29.5(6.7), AC 29.9(6.6) (Table 2).

Results from the first logistic analysis revealed a statistically significant prediction of gaining admission to the ATEP ($x^2 = 18.622$, df = 4, $p = .001$). The Nagelkerke pseudo R^2 indicated that the model accounted for approximately 8.2% of the total variance. The pseudo R^2 was converted to Cohen's (1988) f^2 statistic, where .02 equals a small effect size, values of .15 identify a medium effect, and values .35 and above connote a large effect.[26] Therefore, the obtained f^2 (.07) suggested the presence of a

small-to-medium effect size. Results from the second logistic regression indicated that the four predictors of CE, RO, AC, and AE failed to provide a statistically significant prediction of passing the BOC exam on the 1st try ($x^2 = 2.653$, df = 4, $p = .617$).

Table 3 presents regression coefficients (*B*), Wald statistics, significance levels, odds ratios, and 95% confidence limits for the odds ratio for each predictor in the model. The Wald test revealed that two design variables (predictors) were statistically significant: (1) Concrete Experience ($p = .04$) and (2) Reflective Observation ($p = .008$). These two findings represent unique effects. In other words, they are the result of predicting the outcome variable after controlling for the effects of all of the other predictors in the model (i.e., RO, AC, and AE in the case of the Concrete Experience predictor and CE, AC, and AE in the case of the Reflective Observation predictor).[26,27]

Table 4 presents test-retest reliability coefficients. A large expected association was estimated for the sample (i.e., the $r = .70$), which corresponds to the minimum test-retest reliability specified in leading textbooks on educational and psychological measurement.[22-24] As shown in Table 3, none of the four associations reached the $r = .70$ criterion. At the same time, the $r = .70$ standard is typically evoked for test-retest associations obtained across a two-month period. By contrast, the current study was conducted across a 36 month interval and it is well established that the longer the interval between test periods, the lower the test-retest coefficients.[22-24]

Chapter 4

DISCUSSION

4.1 Learning Abilities/Learning Styles

The first step in determining learning styles based on Kolb's model is in identifying and highlighting learning abilities. In our cohort, active experimentation was the most dominant learning ability during both years of testing. Kolb defines active experimentation as those who take a practical approach and are concerned with what really works, as opposed to simply watching a situation unfold.[6] In other words, individuals with this predominant learning ability perform best in situations that rely on doing rather than excessive thought. As the importance of evidence-based practice is stressed in the educational preparation of today's AT students, it makes sense that students with AE as a dominant learning ability would be successful. Evidence-based practice is the method of using not only clinical or hands-on experiences, but also taking into consideration the newest research to decide what best practices the clinician should be using to provide efficient, quality care.

Based on previous research centered on learning styles in medical,[7-10] dental[14] and athletic training students,[11-13,15,16,28] we hypothesized that there would be one predominant learning style and that it would most likely be either accommodators or convergers. This assumption is predicated on the fact that these future health professionals learn best by hands-on, action-oriented experiences. Interestingly, the predominant learning style in our cohort of AT students changed from the first to the

final year of testing. The range of learning styles from students tested during the first year ranged from accommodators (30.6%), convergers (29.2%), assimilators (22.8%), and divergers (17.4%) (Table 1). The predominant accommodator learning style is composed of active experimentation and concrete experience learning abilities. Generally speaking accommodators prefer "hands-on" experiences and are involved in action-oriented careers. A converger has a learning style that relies heavily on active experimentation and they too are involved in "hand-on" types of professions. It would seem reasonable that both of these learning styles relate well to the athletic training profession and we speculate that student's interest in the profession can be attributed in part to these learning preferences.

Surprisingly, when we retested our AT students during their final year in the ATEP, the converger learning style (39.4%) prevailed. This was followed by assimilator (25.7%), accommodator (23.9%), and diverger (11%) (Table 1). We acknowledge that this is partly due to the fact that our athletic training student cohort was reduced by about one-half from the first to second test session because not everyone was admitted into the ATEP. Kolb has suggested that the more education a person receives, the more they develop strengths in abstract conceptualization and reflective observation.[18] Nonetheless, it acknowledges the fact that convergers still reflect a learning style that is related to the "hands-on" aspects of the athletic training profession.

Our finding are inconsistent with previous research involving students in various health professions that reported the dominant learning style was that of assimilators.[9-12,28] In an examination of medical students Lynch et al. reported a majority of assimilators followed closely by convergers.[9] The Stradley et al.[12] paper reported a tie between

accommodators and assimilators; while Coker et al.[29] suggested that students were assimilators in the classroom where abstract thought is stressed; and converger's in the clinical setting where "hands-on" experience is needed. Overall, this may point to a trend in which prospective health care professionals are beginning to incorporate abstract thought (reflective observation and abstract conceptualization) to better prepare themselves for allied-health careers. With this knowledge educators can expect their students to not only want the "hands-on" clinical experiences but also yearn to understand the science and evidence behind clinical methods and practices.

4.2 Prediction Analysis

The overall percentage of those who took the Kolb LSI during their first year and who gained admission into the program was 45.2%. Our logistic regression analysis examining if there was a certain learning ability that could predict admission into the ATEP found that there was some significant predictive qualities. Concrete experience and reflective observation were the two learning abilities found to be the greatest predictors of admission into the ATEP. It is important to remember that the learning ability values from the cohort during the first year of testing were used as the predictors in the regression equation. In Kolb's learning style model CE and RO individually contribute to accommodator and assimilator learning styles, respectively; while when combined they contribute to a diverger learning style. It is important to note that the most prevalent learning style from the first year cohort was that of accommodators followed by assimilators. The findings of our study with relation to program admission prediction are in contrast with those reported by Brower et al. who stated overall grade point average (GPA) was the best predictor of admission.[11] Interestingly, overall GPA, in

addition to core course GPA, are two contributors to our own ATEP admission criteria; however, we did not utilize this information as part of our prediction analysis and focused only on learning abilities. We acknowledge that admission achievement cannot rely solely on learning ability and that it is multifaceted. In fact, Kolb's experiential learning theory suggests that the learning styles alone should be used to demonstrate the learner's strengths and weaknesses and that educators work to strengthen those weaknesses in order to facilitate balanced learning.

The prediction analysis involving learning ability and BOC exam success did not yield any significant results. The overall percentage of those that passed the BOC exam on the first attempt was 81.3%. While this is a very good reflection on our ATEP, the low percentage of students failing the BOC examination on their first attempt limited the strength of the regression analysis. We contend that success on the BOC examination is more likely related to individual preparation and other academic factors rather than solely on learning style. Middlemas et al.[29] found that GPA was a significant predictor of certification examination performance when compared to curriculum vs. internship candidates, gender, and clinical hours completed. Although GPA was a significant predictor in their study, the researchers stated that their model did not account for all of the variance and therefore the greatest predictor was probably another variable not studied.[29] In an earlier report, Draper et al. conveyed that GPA was the best predictor of success on the NATA certification examination.[16] Of importance, we point out the fact that the 1989 certification examination was drastically different from that of today's certification examination. A later study by Harrelson et al. reported that no single academic factor could be used to predict success on the BOC exam.[13] Lastly, although

somewhat unrelated, Lynch and colleagues reported that medical students who were convergers and assimilators performed better on single, best answer multiple choice exams.[9] Perhaps this finding could be more related to the format of the contemporary BOC examination. We recommend that future analyses utilized to predict BOC exam success involve a combination of academic factors including GPA and learning abilities and preferences.

Kolb's primary intention for the Kolb LSI was that it be used as a self-assessment tool to derive learning ability and learning style.[30] Several studies examining the psychometric properties of the LSI have demonstrated low test-retest reliability.[11,12,17] The results of our reliability analysis (Table 4) are in line with those previously reported with our values ranging from .24 to .50. This demonstrates that the student's learning ability scores from test 1 to test 2, in most cases, three and a half years later, were relatively stable. Although the individual reliability of each of the correlations appears to be low, the overall reliability, along with the theory behind the learning abilities, strengthens the argument of continued use of the Kolb's LSI.[18]

4.3 Conclusion

Athletic training students have a broad range of learning styles which create challenges for educators. As educators continue to reevaluate their teaching methods and curriculum, consideration should be taken, not only for the current best practices, but also for student's learning strengths and weaknesses. Admission success in this cohort of AT students is best predicted from those displaying the CE and RO learning abilities. Conversely, none of the learning abilities predicted BOC exam outcome. As the

education of athletic training students evolves, curriculum must remain dynamic and exciting in order to maintain student's interest and retention.

Table 1: Frequency Counts and Percentages for Categorical Variables

Variable	Frequency[1, 2]
Overall Learning Style at Time 1	
Accommodator	86 (30.6)
Assimilator	64 (22.8)
Converger	82 (29.2)
Diverger	49 (17.4)
Overall Learning Style at Time 2	
Accommodator	26 (23.9)
Assimilator	28 (25.7)
Converger	43 (39.4)
Diverger	12 (11.0)
Exam	
Pass	74 (81.3)
Fail	17(18.7)
Program Admission	
Yes	142 (45.2)
No	172 (54.8)

[1]Numbers outside parentheses represent frequency counts and numbers within parentheses represent percentages.
[2]Percentages rounded at first decimal for convenient presentation.

Table 2: Distributional Characteristics

	Distributional Characteristics	
Learning Abilities	***M***[1]	***SD***[1]
First Year of Testing		
Concrete Experience	25.7	6.8
Reflective Observation	29.8	6.8
Abstract Conceptualization	28.6	6.9
Active Experimentation	37.4	6.6
Second Year of Testing		
Concrete Experience	22.7	6.6
Reflective Observation	29.5	6.7
Abstract Conceptualization	29.9	6.6
Active Experimentation	38.3	6.2

Note: *M* = mean, *SD* = standard deviation.
[1]Percentages rounded at first decimal for convenient presentation.

Table 3: Logistic Regression Summary for Variables Predicting Gaining Admission to ATEP

					95% CL for Odds Ratio	
Predictor	*B*	Wald	*p*	Odds[1] Ratio	Lower	Upper
Concrete Experience	-.051	4.239	.04	.951	.906	.998
Reflective Observation	-.064	6.946	.004	.938	.894	.984
Abstract Conceptualization	-.004	0.034	.86			
Active Experimentation	.027	1.115	.28			
Constant	1.850	0.612				

Note: *B* = unstandardized coefficient, *N* = 125, PWB = the Perceived Well-Being scale, GOSS = the Groningen Orthopaedic Social Support Scale, and GARS = the Groningen Activity Restriction Scale.

[1]Odds ratios and confidence limits presented only to statistically significant predictors to clarify presentation.

Table 4: Test-Retest Reliability Coefficients

Variable	Test-Retest Coefficient
Concrete Experience	.24
Reflective Observation	.27
Abstract Conceptualization	.50
Active Experimentation	.32

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Appendix A

INFORMED CONSENT FORM

University of Delaware Human Subjects
Informed Consent Form

RESEARCH STUDY:
Learning Styles of Undergraduate Athletic Training Students in a CAATE-Accredited Athletic Training Education Program

INVESTIGATORS:
Alyssa Reyes (Principal Investigator) and Thomas W. Kaminski, PhD (Advisor) - Department of Kinesiology and Applied Physiology.

INTRODUCTION:
You are being invited to participate in a research study which will examine learning styles and the relationship with Athletic Training Education Program (ATEP) admission, overall change during your time as an undergraduate student at the University of Delaware, and success on the Board of Certification (BOC) exam.

PURPOSE:
The purpose of this study is to identify and evaluate learning styles of undergraduate athletic training students at the University of Delaware.

PROCEDURES:
You are being asked to complete the Kolb Learning Styles Inventory (LSI). It is a series of 12 statements in which you will rank each statement from one to four. The survey will require 15 minutes to complete. You are being asked to complete this survey once during your first year in college. Additionally, if you gain admission into the Athletic Training Education Program, you will be asked to complete the survey again during your fourth (final) year in college. During your fourth year, if sitting for the Board of Certification Exam (BOC) you will be asked to provide your pass/fail results.

CONDITIONS OF SUBJECT PARTICIPATION
The information obtained by this study will be publicly reported, however all personal information that links you to your results will remain confidential and will only be seen by investigators.

POTENTIAL RISKS AND BENEFITS:
There are no potential risks with this study. You may find it helpful to learn more about your learning profile which may in turn aid you in your academic career at UD.

FINANCIAL CONSIDERATIONS:
There will be no financial compensation for this study. There will be no cost to you for participating in the study.

CONTACTS:
Any questions that you may have that are associated with this research study may be directed toward the following individuals:

Alyssa D. Reyes, ATC, BS
Human Performance Lab
University of Delaware
Newark, Delaware 19716
Phone: (610) 781-8111
adreyes@udel.edu

Thomas W. Kaminski, Ph.D. (Thesis Advisor)
Human Performance Lab
University of Delaware
Newark, Delaware 19716
Phone: (302) 831-6402
kaminski@udel.edu

Your questions concerning your rights in relation to this research study may be directed towards:

Human Subjects Review Board
University of Delaware
Newark, Delaware 19716
Phone: (302) 831-2137

ASSURANCE:
By signing this consent form you indicate that you have read and agreed to all procedures; understand the conditions, the risks and benefits associated with participation as well as the financial considerations. You were also informed that your participation in this research study is considered voluntary and that you may exercise your right to refuse or cease participation at any point. Your discontinuation in this study does not result in penalty or the loss of the previously discussed benefits. All of your personal information will remain confidential. You also understand that a copy of this consent form will be given to you.

CONSENT SIGNATURES

Participant 's Name: _____

Participant 's Signature: _____ Date: _____

I, the investigator, certify that I have explained the procedures, conditions of participation, risks and benefits associated with participation as well as the financial considerations. I also informed the participant that their involvement in this research study is considered voluntary and that he/she may exercise their right to refuse or cease participation at any point. I have answered all questions that the participant asked and have witnessed the above signature.

Investigator's Name: _____

Investigator's Signature: _____ Date: _____

Signed consent forms will be retained by the researcher for three years after completion of the research.

Appendix B

SPECIFIC AIMS

Educators in different settings across the country continually strive to improve their teaching techniques so students are successful in their desired professions. While there have been numerous studies on medical, nursing, and dental students, few studies have examined learning styles of athletic training students. Additionally, few studies have examined learning styles as they relate to success on the Board of Certification (BOC) examination for athletic trainers. While much of the education of athletic training students happens in the classroom setting, hands-on experience in the clinical setting is an integral part of any Athletic Training Education Program (ATEP). A student's ability to apply what they have learned in the classroom to the clinical setting can significantly determine their success in an ATEP. Enhancing ways to connect with students by having a greater understanding of their learning styles may in turn prepare them more effectively for success in the clinical setting. At the University of Delaware, examining learning styles of athletic training students has occurred each year for the last 10 years; whereas student are evaluated before they begin as Athletic Training Interest (ATI) students and again in their final year of the ATEP. The purpose of this study is to identify and evaluate learning styles of undergraduate athletic training students at the University of Delaware and determine if there is a learning style profile that translates into admission acceptance and ultimately success on the BOC examination.

Overall, any significant findings will be important progress for the growth of athletic training education programs nationwide and the profession in general. We will accomplish this by examining Kolb's Learning Style Inventory (LSI) scores of athletic training students in an undergraduate ATEP during their first and fourth years of

matriculation. We will also collect pass/fail results from graduating athletic training students who have taken the BOC exam.

Specific Aim #1:

We aim to examine learning styles in a group of athletic training students at the University of Delaware. In doing so, we also examine if those inventory scores present a dominant learning style during the first and fourth year of testing.

Hypothesis 1a:

We propose that a predominant learning style (accommodator, assimilator, converger, and diverger) will emerge among the athletic training students as a group, at both the first and fourth year of test administration.

Specific Aim #2

ATI students are not guaranteed a spot in the ATEP and spend their first year attempting to gain admission. Therefore, we aim to determine if there is a predominant learning style associated with gaining admission into the undergraduate ATEP at the University of Delaware.

Hypothesis 2:

We anticipate that a predominant learning style will emerge in the ATI students selected for admission into the ATEP that is different from those not chosen.

Specific Aim #3:

Success on the BOC examination is the ultimate outcome measure for any ATEP. This third aim will attempt to determine if there is a predominant learning style within UD's ATEP that translates into success (pass on the 1st try) on the BOC examination for athletic trainers.

Hypothesis 3:

We anticipate that a predominant learning style will emerge in the fourth year athletic training students who are successful in passing the BOC examination for athletic trainers on the 1st attempt.

Appendix C

Background and Significance

The athletic training profession continually grows and transforms based on the everyday professional needs. As the profession develops, the education of its students must also evolve. Allied-health professions have always strived to better educate and prepare their students for success in their particular field. Previously, with other professions, growth has been achieved by developing more rigorous educational programs and higher degree standards. The athletic training profession also maintains this desire to evolve and may eventually require higher degrees and more intense educational programs. Multiple studies have looked at other medical professions such as nurses, physicians and dental students.[7,8,9,10,14] Few studies have looked at athletic training students and their learning styles.[11,12,13,15,16,28] Even with these studies, little is still known about athletic training students and the most effective way to educate them. Working to better understand how students learn will enable educators to reevaluate their teaching strategies and therefore adapt them to effectively cater to their student's needs.

Although no two students experience learning the same way, there seems to be general characteristics that the students in similar concentrations share. According to Kolb in his Experiential Learning Theory, students with undergraduate majors in Art, History, Political Science, English, and Psychology tend to have diverger learning styles. These students have strengths in recognizing problems and brainstorming. Students in engineering and physical science majors are generally convergers. These students generally have strengths in problem solving and decision making. Students in business and management tend to be accommodators and have strengths in leadership and risk taking. Finally, students in economics, mathematics, sociology and chemistry are generally assimilators and have strengths in planning and creating models.[31] Learning

styles have commonly been assessed through self-report instruments. Most of the content contained in these self-report instruments is based on learning theories of psychologists and theorists from the 1980s or earlier.[32] Some self-report instruments that have been used to examine student's and how they learn are: Dunn and Dunn's Learning Style Inventory, Price's Learning Style Inventory (LSI), Learning Preference Inventory (LPI), Myers-Briggs Type Indicators (MTBI)[32], Kolb Learning Styles Inventory (LSI)[7-11], the Productivity Environmental Preference Survey[12,13], Gregorc Mind Styles[14,15], and the Babich and Randol LSI[16].

Kolb stated, in his paper on experiential learning theory, that, "…one's job as an educator is not only to implant new ideas but also to dispose of or modify old ones."[33] According to Kolb, discovering a student's learning style is the basis to developing fundamental practices that will shape a student's educational career. Therefore, educators should focus on designing lectures that can reach all of the students on every level of their learning abilities.[31] Marion Terry discussed learning styles and how they relate to university teaching practices. He stated, "…instructional choices must include two main types of classroom activities and assignments: broader-based options, which permit students to make choices that match their individual learning style preferences, and more focused alternatives, which force students to learn and practice specific learning style skills and strategies that may be less familiar."[34] When both the student and educator are setting educational goals based on the student's specific learning preferences, there may be an increase in the actual absorption and retention of the knowledge being taught. Kolb stated, "You can increase your learning by up to 50 percent if you set clear and meaningful goals."[35]

Learning, the main focus of any educational or profession preparatory program, is defined as the gaining of knowledge or skill by instruction or study. In order to evaluate how a student actually gains information and stores it, the student must first become aware of how their brain functions to properly store this information in the most efficient way possible. One way that researchers or students can find this information is by assessing the learner's different preferences and perceptions of their learning environment. Kazu stated that, "…learning styles reflect the students' preferences on how they perceive the environment, interact with this environment, react and experience learning in this process."[32] While many theorists have created multiple ways to assess learning styles or learning preferences, the common theme between all of the surveys and studies is that every student learns and absorbs information differently and specific to their own strengths and weaknesses. No two students gain knowledge the same way and therefore no specific teaching strategy would efficiently educate every student. Every educator should reflect on the fact that their teaching strategy is the method of delivering information to the students and therefore should not be an afterthought when planning lessons. In Kazu's overview of learning styles, he stated, "Lastly, the teachers should help the students move from one less successful style to another by using teaching styles and thinking skills. The teachers should be concrete and practical, concerned with application."[32] It is important to remember that learning is not a singular process. Instead, learning is a full brain process in which many different sensory and cognitive inputs determine the storage of the information. Because of this educators need to be aware that one singular method of teaching will not adequately reach all the student's senses, strengths or cognitive abilities. When educators are planning lessons, another

great tool in their toolbox would be to recognize if there is a general area of strength in which their specific student learns in order to concentrate on those strengths.

With the newest generation of athletic training students, also known as the "millennial generation", it is important for educators to remember that the methods of teaching has changed dramatically from when they were in school. Research by Hughes et al has shown that these new students are confident, they like working in groups, and are under a lot of pressure to achieve high marks and be successful in their training.[36] With these characteristics and the high prevalence of technology in the classroom, from new modalities to high tech PowerPoint presentations, it is important to focus on the strengths of these new students. While previous students may have preferred learning through readings and open discussions, today's students may prefer PowerPoint presentations, videos, and hands-on demonstrations. Because of this influx of new technology and the new technology generation, it is important for educators to reevaluate their teaching techniques and shape them to focus on their newest student's strengths and work on building up their weaknesses.[36]

Although ATEPs employ a teaching strategy that requires students to be tested and retested on multiple occasions to ensure proper absorption of the material, there still seems to be some areas that are not effectively taught. This may be leading to multiple entry-level athletic trainers that do not feel prepared in certain areas once they graduate from an undergraduate program. Not only do the actual students feel unprepared, but Hamson-Utley et al. found that program directors also feel that their students are not adequately educated in some areas of the curriculum.[37] Stiller-Ostrowski et al. reviewed the literature and found that 60 percent of athletic trainers surveyed were not comfortable

with the amount of education they received for psychosocial intervention and referral.[38] The researchers then used an educational intervention that aimed at improving psychosocial intervention and referral confidence, and retention of knowledge. After the intervention, the researchers found that there was an increase in the retention of the psychosocial intervention and referral information.[38] Hamson-Utley et al. found that programs director's confidence in their student's psychosocial intervention and referral abilities greatly correlated with how they taught the material.[37] Program directors who taught the material with practical assessment methods versus instructional methods were more confident in their student's abilities.[37] This shows that the method of teaching and absorption of the material by students is greatly dependent on one another. Although this is only one of the 12 content areas required in the athletic training curriculum, future studies may discover more areas in the curriculum that graduating athletic training students feel weak in, or feel they are not adequately prepared for.

Kimberly Peer stated, in her review of the literature based on goal orientation in athletic training, that there must be an effort made by the educators to structure academic experiences that enhance the balance between challenges and support and therefore strengthen a student's learning experiences.[39] The article also focused on lifelong learning abilities in athletic trainers. Because athletic trainers continually require evolving education, it is important to instill quality learning abilities during their time spent in an undergraduate program to foster their learning throughout the rest of their life and career.[39]

Mensch and Mitchell found, when examining the perceptions of athletic training recruits, that there were three contributing factors to why a student showed interest in the

program.[40] The factors were: a strong affiliation to a sports/team model, initial exposure at the high school level, and an incomplete understanding of athletic training.[40] While this information is important for program directors to recruit and retain students for the program, learning about the recruit's learning styles in advance may possibly give program directors a learning profile of students that will succeed in the program. Together, this knowledge and the potential knowledge from this study could give program directors many different tools to evaluate and retain their students in an ATEP.

Athletic trainers in different settings have also been found to describe some weaknesses of their education in regards to their employment setting. Schilling found that athletic trainers in the industrial setting felt limited in their knowledge of ergonomics and athletic trainers in the clinical setting felt limited in their knowledge of communication skills and insurance issues.[41,42]

Learning is one of the main basic concepts of human life and adaptation. Humans learn in order to adapt to their surroundings, improve themselves, and hopefully, enrich others with their knowledge. Humans are naturally curious creatures and the way we explain our lives is by seeing, touching, observing, and acting. All of these processes contribute to how one learns. As humans, we wish to perform better and faster. This also means we want to learn as effectively as possible. Finding a personal learning profile, how one learns and preserves information, can greatly impact how well someone can retain information.

Many medical students' education greatly differs from other profession's students. Medical students not only learn in the classroom setting, as many other students would, but also take their learning into a clinical setting. In the clinical setting their

retention of knowledge is tested with real life, hands on situations. Because athletic training students, along with nursing and dental students, use many hands on experiences in their education programs, they may learn differently than those who only learn by watching or listening in the classroom setting. Determining if athletic training students do possess a common learning style would greatly benefit their educators when creating lessons. The lessons made will then adhere to the student's learning strengths and improve their weaknesses. Previous research on learning styles of medical, nursing, and dental students have all found differing results and more research is still needed to come to a conclusion that can generalize student's learning styles.

Hendricson et al. studied 87 dental students over a four year period using the Gregorc Mind Styles Delineator.[14] Although this is not the same inventory as the Kolb LSI, it does evaluate students based on concrete and abstract experience. The concrete sequential mind style, as defined by the researchers, was a mind style where learners preferred "hand-on" experiences and concrete, structured learning experiences. This mind style is similar to Kolb's concrete experience learning ability and therefore the accommodator or diverger learning styles which rely heavily on the concrete experience learning ability. Hendricson et al. found that dental student's learning styles not only changed over time, but also tended towards a more concrete learning style.[14]

Gurpinar et al. surveyed 455 medical students in three different curriculum models.[7] The Kolb LSI was given to medical students in the first year and again at the end of their second year in school. The researchers found that the majority of the students were assimilators and that their learning style did not change within the year surveyed.

The researchers also found no difference in learning styles based off of the three different curriculum models.[7]

Cavanaugh et al. studied 192 nursing students before they received any formal training.[8] Using the Kolb LSI, the researchers found that there was a slim majority of students that preferred a concrete learning style. They also looked at age, sex, and employment before becoming a nursing student and its relationship to their learning style. There were no significant correlations found between any of these associations. Although the distributions of learning styles were fairly even, the most prevalent learning style was diverger, closely followed by convergers and accommodators.[8]

Lynch et al. examined two classes of 227 medical students, each during their third year of schooling, looking at their examination performance in relation to their learning style.[9] The majority of students were characterized as convergers. The researchers also found that convergers and assimilators performed better on two out of three of the exams tested. These two exams were characterized as single best answer, multiple choice questions. There was no significant relationship between the computer based, complex test and learning style.[9]

Rakoczy and Money examined nursing students during a three year longitudinal study.[10] Students were tested with the Kolb LSI during the first, second, and third year of nursing school. A total of 458 students were tested over the three year period. They found a dominant learning style of an assimilator.[10]

The field of research dedicated to nursing, dental and medical student's learning styles seems to be split in their conclusions. Because much of the educational lessons are presented in a hands-on type environment, the predicted dominant learning style of these

students would be a strong concrete learning style dominant ability. However, based on the studies previously reviewed, only two of them found concrete learning abilities to be the dominant influence.[8,14] While medical students are not taught all of the same material as athletic training students, both types of students undergo many hours of clinical education where one would expect to see a concrete learning style thrive. In regards to these findings, the hands-on experience may not require one to have a dominant concrete learning style to achieve success in the program. Although the research is split on which dominant learning style medical, dental and nursing students have, this research study still expects to see a concrete learning style, a finding similar to that of some studies examining solely athletic training students.

Cheryl Coker examined 26 athletic training students in a CAATE-approved undergraduate program.[28] The researcher was looking at whether there was a difference between the students' learning styles during their clinical time versus their classroom time. Students took the inventory twice, once based on clinical learning and the other based on classroom learning. The students were simply told to refocus their thoughts from the classroom setting to the clinical setting when taking the inventory the second time. Coker found that the students preferred a reflective observation type learning in the classroom setting and an abstract conceptualization type learning in the clinical setting. She also found that 58 perfect of the student's learning styles changed from the classroom to clinical setting. The predominant learning style in the classroom setting was assimilator, while the predominant learning style in the clinical setting was converger.[28]

Stradley et al. examined learning styles of athletic training students across 50 different CAAHEP ATEP programs using the Productively and Environmental

Preference survey (PEPS) and the Kolb LSI.[12] Using the PEPS, 193 students were examined. The PEPS results only showed a preference for afternoon learning. The Kolb LSI found that there was no outstanding majority of one learning style over any others. The slim majority of learning styles were accommodators and assimilators (both 29.3%). The researchers also looked at if the learning style differed by geographical area of the country. They found no difference between geographical region and learning styles.[12]

Harrelson et al. also used the PEPS to examine athletic training students. They looked at 27 athletic training students in their first or second year of an undergraduate program. The researchers found that female student's preferred more light in the classroom and first year students preferred afternoon class times.[13] These findings are fairly similar to that of Stradley, who also found a preference to afternoon class times using the PEPS.[12]

Brower et al. examined learning styles and their relationship to program admission success with athletic training students. They looked at 40 undergraduate students applying for two different ATEP programs. They found no difference between those individual's learning styles who were admitted and those who were not. They did find, however, that the majority of the subject's learning styles were assimilator.[11]

Gould and Caswell using the Gregorc Style Delineator instrument, examined athletic training students and their educators to look for a difference in the way each group learns.[15] The researchers surveyed a total of 201 undergraduate athletic training students and 43 program directors. A concrete sequential mind style was found to be the majority preference (63.4%) among the students and program directors. When broken down into genders, male and females both still preferred the concrete sequential mind

style. This finding was important because it showed that again, athletic training students preferred a hands-on environment. This is the finding we expect to see in our study.[15]

Draper conducted one of the first studies examining athletic training students. The instrument used the LSI made by Babich and Randol.[16] The study looked at 102 students and found that most were independent learners who preferred written exams to oral exams. Draper did not find a relationship between those who preferred a certain type of exam doing better on any specific part of the exam, but did find those with a higher GPA performed better on the written portion of the exam. The study found little relationship between performance on the exam and learning style. With these findings as an example, this study expects to see similar findings. A passing result on the BOC exam will most likely be the result of hard work and studying and not a specific learning ability or learning preference.[16]

Finding a common theme among athletic training student's learning styles would help their educators better understand their educational needs and therefore help them perform better in the clinical setting. What may also be found is that being in an athletic training program and using your knowledge and skills in a clinical setting may actually change the way one learns. If there is a generally cohesive learning style among athletic training students, they may gain this by solely being a part of an ATEP program and therefore be encouraged to learn a certain way to achieve success in the program.

Helping athletic training students perform better in the clinical setting is one step towards helping them successfully pass the profession's certification exam called the Board of Certification (BOC) exam. Students take this exam at the end of their last year in an ATEP. It is a comprehensive exam with a pass/fail result that determines whether

or not a student is eligible to obtain the Athletic Trainer Certified (ATC) credentials. ATEPs strive to best educate their students to achieve a pass result on the first time taking the exam. Learning styles that may help students become more likely to achieve a pass result on the first time taking the exam would be an important factor to consider. If a student had a learning style that was more likely to achieve a pass result, they may know that hard work and studying will most likely pay off. If a student does not have the learning style that will more likely predispose them to a pass result, they may know to get extra help in preparation for the exam.

Many ATEPs require extensive entrance requirements and in many programs, not all that apply will be accepted. Being able to determine success in an athletic training education program based on learning style would be a great help in choosing which student will be granted entrance into the program and which will be turned away. Although learning style alone would not determine entrance into an ATEP, this one factor would still become another part of the student's profile examined for entrance along with GPA, recommendations, and interview success. Having a predictor of success in any program, especially allied-health program, would better help educators and directors decide which students will thrive in the program or may need extra help.

Overall, any information about athletic training student's learning styles will greatly benefit the profession. Educators will have a better idea of how to properly teach and present information catered towards their student's needs, and students will have a higher rate of success with lessons presented in a manner that will supplement their strengths. As with any growing profession, striving to understand and educate its future professionals is the basis for the profession's continued success.