Journal of Athletic Training 1998;33: 50–53

An Assessment of Learning Styles Among Undergraduate Athletic Training Students

Gary L. Harrelson, EdD, ATC*†; Deidre Leaver-Dunn, MEd, ATC†; Kenneth E. Wright, DA, ATC†

*DCH Regional Medical Center, Tuscaloosa, AL 35476; †The University of Alabama, Tuscaloosa, AL

Objective: Increased attention has been directed toward assessing and improving academic quality in athletic training education. The educational process has been assessed from a global level, but little is known about how athletic training students learn. The purpose of this investigation was to assess the learning styles of undergraduate athletic training students.

Design and Setting: Undergraduate students enrolled in a Committee on Accreditation of Allied Health Education Programs (CAAHEP)-accredited athletic training education program completed a learning styles inventory during a regularly scheduled athletic training class at the start of the spring semester.

Subjects: Twenty-seven student athletic trainers (age range, 19–30 yrs, mean age = 20.5 yrs) served as subjects. Sixteen subjects (7 male, 9 female) were in the first year of this 3-year program. Eleven subjects (7 male, 4 female) were second-year students.

Measurements: Learning style was assessed using the Productivity Environmental Preference Survey.

Results: Parametric and nonparametric one-way analyses of variance for each learning subscale by sex and by year in program revealed significant differences ($P < .05$) in light preferences for male and female students. There were also significant differences ($P < .05$) between first- and second-year students in preferences for afternoon learning activities.

Conclusions: These findings suggest that undergraduate athletic training students function best as learners in a well-lit learning environment. The significance of afternoon as the preferred time for learning reinforces the importance of the clinical setting in the introduction and mastery of skills. Athletic training educators and clinical instructors can use these results as they examine their teaching strategies and educational environments.

Key Words: learning preferences, Productivity Environmental Preference Survey

In recent years increased attention has been directed toward assessing and improving academic quality in higher education[1] and the education process for athletic trainers. The National Athletic Trainers' Association Education Task Force[2] was created to examine athletic training education on the global level. However, beyond the publication of certification examination results, little is known about athletic training students, and still less is known about how they learn. An understanding of student learning preferences would allow athletic training educators to strengthen the quality of teaching as the content and process of athletic training education are standardized.

A review of the literature related to the investigation of learning styles shows that only Draper[3] has assessed the learning styles of athletic training students. Many other studies of learning styles have employed a variety of assessment instruments.[4–15]

Students in allied health and medical professions have been the most common subjects in learning style investigations, with nursing students studied most frequently.[6,8,10] Most of these studies were completed in the 1980s, with some works extending into the early part of this decade. Despite concerns about its validity and reliability,[6,11,16] the Learning Styles Inventory developed by Kolb (Kolb's LSI) is the most widely used instrument for investigating learning styles.[7,11,13–15] Several other assessment instruments are also described.[3–5,9,12]

The purpose of this study was to assess the learning styles of students enrolled in a Committee on Accreditation of Allied Health Education Programs (CAAHEP)-accredited undergraduate athletic training education program. Specifically, we investigated differences in learning style between the sexes and between students at different levels of an athletic training education program.

METHODS

Subjects

Twenty-seven student athletic trainers (26 white, 1 black; age range, 19–30 yrs, mean age = 20.5 yrs) enrolled in a CAAHEP-accredited undergraduate athletic training education program served as subjects. Sixteen subjects (7 male, 9 female) were in their first year of a 3-year program and 11 (7 male, 4 female) were second-year students.

Instrument

We used the Productivity Environmental Preference Survey (PEPS) (Price Systems, Inc, Lawrence, KS) to evaluate learning style. The PEPS assesses individual productivity and learning style and analyzes the conditions under which an adult is most likely to achieve, create, produce, solve problems, make decisions, or learn.[12] Subjects complete the PEPS by responding to 100 5-point Likert scale items (strongly agree to strongly disagree) related to 20 different elements of learning (Table 1). Reliabilities for the 20 PEPS subscales range from 0.39 to 0.87; 75% of the reliability coefficients are equal to or greater than 0.60.[12]

Price Systems, Inc calculates raw and standard PEPS scores for all manually completed surveys. Standard scores on each subscale are calculated based on a random sample of 1000 subjects, from a national database of subjects who have taken the PEPS.[12] The mean standard score is 50 with a standard deviation of 10.[12] A standard score of 40 or less, or 60 or more, indicates the relative importance of that variable with respect to learning style.[12] A standard score between 40 and 60 indicates variable importance for that element of learning.[12]

Protocol

Subjects gave their informed consent prior to participation. This study was approved by the Internal Review Board of The University of Alabama, Tuscaloosa, AL. We administered the surveys at the start of the spring semester during two separate, regularly scheduled athletic training class periods. We instructed the subjects to respond to the survey questions with their immediate reaction. Subjects responded without distinguishing between the different preferences they might have had for studying athletic training materials versus general studies.

Data Analysis

We returned the completed surveys to Price Systems, Inc for scoring and calculation of raw and standard scores. Standard scores and demographic data for each subject were coded and analyzed using the mainframe version 4.1 of the SPSS statistical software package (SPSS Inc, Chicago, IL). Individual hypothesis tests were conducted using separate parametric one-way analyses of variance (ANOVAs) for 19 of the subscale variables by sex and for these variables by year in program. Nonparametric Kruskal-Wallis one-way ANOVAs were conducted for light by sex and light by year because these data failed to meet the ANOVA assumptions of normality and equal variance. The remaining data satisfied all ANOVA assumptions. The alpha level ($P < .05$) was established a priori for all analyses.

RESULTS

Descriptive statistics show that standard scores tended to fall in the mid-range for most of the subscales, with scores above 60 indicating a clear preference and scores below 40 indicating no preference, for each particular subscale.[12] Sixty nine percent ($n = 11$) of the first-year students had standard scores above 60 for the Structure subscale and 56% ($n = 9$) scored above 60 on the Authority Figures Present subscale (Table 2). Mean standard scores for these subscales were higher for both female and first-year subjects. The mean standard score on the Structure subscale for the entire sample was 62.78. For the Afternoon subscale, mean standard scores for males and first-year subjects both exceeded 60.

The nonparametric one-way ANOVA showed female subjects preferred significantly more light than male subjects, ($\chi 2_{1-0.05}(1) = 5.42$, $P = .02$). First-year students had greater

Table 1. Productivity Environmental Preference Survey Subscale Reliabilities and Descriptions*

Subscale reliability (r)	Description
Sound (.83)	preference for quiet learning area versus learning area with background noise
Light (.84)	preference for natural and/or artificial light in learning area
Warmth (.85)	preference for warm or cool learning area
Formal design (.74)	preference for formal or informal arrangement of learning area
Motivated/unmotivated (.54)	self-direction to initiate and complete assignments and other learning tasks
Persistent (.66)	perseverance to study and fulfill assignments in a timely manner
Responsible (.84)	accountability and dependability to complete assigned tasks
Structure (.63)	desire for strict project/assignment organization and detail clarification
Learning alone/peer-oriented (.84)	preference for learning alone versus learning as part of a group
Authority-oriented learner (.54)	desire for presence or ready availability of instructor/leader
Several ways (.44)	preference for both supervisor-directed and independent learning activities
Auditory preferences (.78)	preference for learning by hearing
Visual preferences (.67)	preference for learning with visual aids (includes reading)
Tactile preferences (.39)	preference for learning by manipulating or moving aids and devices
Kinesthetic preferences (.58)	preference for learning through physical involvement with activity
Requires intake (.82)	desire to be able to eat and/or drink while learning
Evening/morning (.84)	preference for early morning as time of day for learning
Late morning (.79)	preference for late morning as time of day for learning
Afternoon (.87)	preference for afternoon as time of day for learning
Needs mobility (.78)	preference for being able to move around during learning activities

* Price Systems, Inc, Lawrence, KS.

Table 2. Productivity Environmental Preference Survey Subscale Means for Subjects by Group

Subscale	Total Sample	Male	Female	First Year	Second Year
Sound	52.11	51.79	52.46	52.0	52.27
Light	54.74	51.29	58.46	54.88	54.55
Warmth	51.11	48.14	54.31	52.88	48.55
Formal design	50.07	50.0	50.15	51.50	48.0
Motivated/unmotivated	53.11	52.0	54.31	53.50	52.55
Persistent	53.89	53.29	54.54	54.0	53.73
Responsible	47.56	45.0	50.31	48.38	46.36
Structure	62.78*	61.71*	63.92*	63.5*	61.73*
Learning alone/peer-oriented	54.30	54.36	54.23	54.31	54.27
Authority-oriented learner	59.56*	58.36	60.85*	60.25*	58.55
Several ways	49.89	48.0	51.92	48.94	51.27
Auditory preferences	56.15	56.86	55.38	56.63	55.45
Visual preferences	51.78	50.36	53.31	52.0	51.45
Tactile preferences	54.78	54.57	55.0	54.75	54.82
Kinesthetic preferences	54.37	53.86	54.92	54.31	54.45
Requires intake	56.56	55.0	58.23	56.44	56.73
Evening/morning	44.04	41.43	46.85	42.19	46.73
Late morning	46.67	44.29	49.23	44.06	50.45
Afternoon	58.78	60.36*	57.08	62.63*	53.18
Needs mobility	56.33	55.86	56.85	54.13	59.55

* Scores above 60 indicate a clear preference for each subscale; scores below 40 indicate no preference.

preferences for afternoon learning and work activities than second-year students ($F(1,25) = 5.75$, $P = .02$) (Table 3). Year in program explained 19% of the variance in the Afternoon subscale standard score. A factorial ANOVA revealed no significant interactive effects between year in program and sex on the Afternoon subscale.

DISCUSSION

The lack of a clear preference for kinesthetic and tactile learning experiences among the subjects in our study is somewhat surprising. The desire for hands-on learning activities has been strongly associated with allied medical and medical students.

Draper[3] administered Babich and Randol's Learning Styles Inventory to 102 candidates taking the NATA certification examination. This 35-item survey measures learning preferences on a Likert scale. Results of this study showed that 60% of the respondents were classified as kinesthetic learners.[3]

Other investigations[5,9,14] have identified the importance of direct and kinesthetic experiences to learning in allied health programs. Blagg[5] administered Canfield's Learning Styles Inventory and 3 additional personality tests to 51 graduate students in a variety of allied health programs in order to predict academic success. Canfield's Learning Styles is a 30-item instrument in which subjects rank order their preferences for learning situations. Analysis of learning style scores combined with subjects' master's comprehensive examination scores identified direct, hands-on experience as a useful predictor of academic success.[5]

These data are supported by Stafford's[14] study of occupational therapy students. The 9-item version of Kolb's LSI, a 40-item learning inventory, and subjects' clinical performance evaluations were analyzed. A strong correlation was found between a preference for hands-on learning and success in working clinically with patients with both mental and physical disabilities.[14]

The Gregorc Learning Style Delineator was administered over four consecutive years to assess the learning styles of 87 dental students.[9] This instrument involves the ranking of ten word sets in order of how they describe the subject as a learner. A concrete-sequential learning style, associated with a preference for hands-on, structured learning experiences, was identified most frequently in these subjects.[9]

The disparity between the Tactile and Kinesthetic subscale results of our study and the literature may be semantic

Table 3. ANOVA Probability Values for Each Subscale

Subscale	By Sex	By Year in Program
Sound	.85	.94
Light	.02*	.93
Warmth	.15	.32
Formal design	.89	.46
Motivated/unmotivated	.24	.66
Persistent	.57	.90
Responsible	.09	.54
Structure	.28	.39
Learning alone/peer-oriented	.97	.99
Authority-oriented learner	.36	.54
Several ways	.15	.41
Auditory preferences	.73	.79
Visual preferences	.20	.82
Tactile preferences	.85	.98
Kinesthetic preferences	.50	.93
Requires intake	.28	.93
Evening/morning	.10	.16
Late morning	.23	.12
Afternoon	.45	.02*
Needs mobility	.76	.09

* $P < .05$.

in nature. In addition, each of the preceding investigations used a different assessment instrument, making it difficult to compare across studies. We believe that the previous identification of allied health students as kinesthetic learners is accurate. A more stringent definition of kinesthetic and tactile activities may be contained within the PEPS, resulting in lower scores for these particular subscales. These results may also indicate that subjects' preferences vary according to specific athletic training topics. Athletic training educators must recognize that certain subjects lend themselves to hands-on activities, whereas others do not, and vary activities appropriately.

Sex preferences for light are not reported elsewhere in the learning styles literature. Here again, the identification of this difference may lie in the specificity of the PEPS instrument. Our results suggest that all didactic and clinical learning areas should be well-lit, with the inclusion of areas of even brighter lighting.

The preference among first-year student athletic trainers for afternoon learning and work times poses a challenge and a reminder. Traditionally athletic training classes are in the mornings, with afternoons reserved for supervised clinical experiences. Although didactic and clinical schedules are not flexible, instructors and clinical supervisors should recognize the preference for afternoon learning. Our results reinforce the importance of the clinical setting for the instruction and refinement of practical skills.

First-year students also demonstrated stronger preferences for structured learning experiences and the presence or ready accessibility of authority figures. Although second-year students had lower mean standard scores for these subscales, means for the total sample indicated the importance of these variables to all of the subjects. These findings conflict with those of Draper,[3] who found that 63% of certification examination candidates classified themselves as independent learners. Educators should provide specific instructions and frequent feedback and clarify expectations for assignments. The educator should be accessible for supervision as requested by individual learners.

CONCLUSIONS

As athletic training evolves and educational standards for the profession become more stringent, athletic training educators must begin to examine their instructional methods and the learning preferences of their students. The relationship between learning preference, teaching style, and student outcome must be considered. Learning activities in the classroom and the clinical setting must attempt to match student preferences, teaching methods, and instructional environments.

Although this study is limited by repeated testing and the small number of subjects, it provides another piece of information in the evolving area of athletic training education. Further research is needed to investigate the relationship between learning and teaching styles and educational outcomes. Additional study is also needed to examine the impact of demographic and educational variables on learning style and to develop a predictive model for learning preference.

REFERENCES

1. Sheppard C, Gilbert J. Course design, teaching method and student epistemology. *Higher Educ.* 1991;22:229–249.
2. Education Task Force. A report from the Education Task Force. *NATA News.* Feb 1996;19–27.
3. Draper DO. Students' learning styles compared with their performance on the NATA Certification Exam. *Athl Train, JNATA.* 1989;24:234–235,275.
4. Billings DM. Assessing learning styles using a computerized learning styles inventory. *Comput Nurs.* 1991;9:121–125.
5. Blagg JD. Cognitive styles and learning styles as predictors of academic success in a graduate allied health education program. *J Allied Health.* 1985;2:89–98.
6. Fox RD. Learning styles and instructional preferences in continuing education for health professionals: a validity study of the LSI. *Adult Educ Q.* 1984;35:72–85.
7. Green DW, Snell JC, Parimanath AR. Learning styles in assessment of students. *Percept Mot Skills.* 1990;70:363–369.
8. Griggs D, Griggs SA, Dunn R, Ingham J. Accommodating nursing students' diverse learning styles. *Nurs Educ.* 1994;19:41–45.
9. Hendricson WD, Berlocher WC, Herbert RJ. A four-year longitudinal study of dental students' learning styles. *J Dent Educ.* 1987;51:175–181.
10. Merritt SL, Marshall JC. Reliability and construct validity of alternate forms of the CLS Inventory. *Adv Nurs Sci.* 1984;7:78–85.
11. Newstead SE. A study of two "quick-and-easy" methods of assessing individual differences in student learning. *Br J Educ Psychol.* 1992;62: 299–312.
12. Price GE, Dunn R, Dunn K. *Productivity Environmental Preference Survey Manual.* Lawrence, KS: Price Systems, Inc; 1991:4–9,56.
13. Ribich FD, Schmeck RR. Multivariate relationships between measures of learning style and memory. *J Res Pers.* 1979;13:515–529.
14. Stafford EM. Relationship between occupational therapy student learning styles and clinic performance. *Am J Occup Ther.* 1986;40:34–39.
15. Zakrajsek DB, Johnson RL, Walker DB. Comparison of learning styles between physical education and dance majors. *Percept Mot Skills.* 1984; 58:583–588.
16. Steggert Hunsaker J. The Experiential Learning Model and the Learning Style Inventory: an assessment of current findings. *J Exp Learn Stim.* 1981;2:145–152.