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Multiple Intelligence Profiles of Athletic Training Students

Matthew Kutz, Ph.D, ATC, CSCS[1]
Stephanie Dyer, M.Ed., ATC[2]
Brian Campbell, Ph.D[3]

1. Clinical Education Coordinator, Bowling Green State University, Bowling Green, Ohio
2. Assistant Athletic Trainer, Purdue University, West Lafayette, Indiana
3. Associate Professor, Bowling Green State University, Bowling Green, Ohio

United States

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ABSTRACT
Context: Gardner's Multiple Intelligence (MI) theory identifies nine "intelligences" (i.e., ways of learning) that help individuals acquire and apply knowledge in relevant contexts. **Objective**: To explore athletic training students' (ATS) dominant intelligences and to observe if "intelligences" differ according to selected demographic variables. **Design**: The Multiple Intelligence Inventory (MII) was used to identify the dominant intelligences of ATS's. **Setting:** Athletic training students actively engaged in a CAATE-accredited educational program. **Participants**: Eighty-five (85) ATSs participated in the study; mean age 21±1.9; 58% were female and 42% male. Thirty-four (40%) were in their second semester, 15 (18%) were in their third semester, 16 (19%) were in their fourth semester, and 24 (20%) were in at least their fifth semester. **Main Outcome Measures**: Descriptive statistics and frequencies were used to report distribution of multiple intelligences, independent *t*-tests and ANOVA (Tukey post hoc) were used to measure differences (p=.05) between ATS. Paired *t*-tests compared differences in intelligences ratings and coefficient alpha was used for internal consistency of the MII. **Results**: Internal consistency for the MII was acceptable (α=.85). *Kinesthetic* was rated highest, M=8.0±1.6 (scale 1-10) and was higher than the other intelligences $t(84)$=4.2 to 16.6 (p=.000); second was *intrapersonal* (M=6.89±2.2). *Verbal* intelligence was the lowest, M=3.85±1.8; and was lower than the other intelligences $t(84)$=-4.0 to -16.6 (p=.000). With one exception, independent *t*-tests and ANOVA comparisons found no differences between ATS's in the demographic variables measured (i.e., semester in school, age, level in ATEP, gender, ethnicity). Only differences in *existential intelligence* were noted between semesters and year in school $F_{(3,81)}$=3.26 (p=.03); $F_{(2,82)}$=4.62 (p=.013). **Conclusions**: *Kinesthetic* intelligence (i.e., hands-on) was the most dominant among ATS and *verbal* intelligence (i.e., auditory) was the lowest. The presence of certain *intelligence* may be attributed to factors other than gender, ethnicity, or semester in school.

INTRODUCTION

Intelligence has been described as adaptation to the environment.[1] Similarly, Gardner described intelligence as the ability of a person to respond to new events and situations successfully and includes the capacity to learn from past experience.[2] Athletic training literature has described intelligence in respect to context as the ability to quickly recognize the important variables in any situation then adjust behavior and actions to act accordingly.[3] According to these descriptions, intelligence quotient (IQ), test performance, or intellectual ability cannot exclusively quantify intelligence. Traub stated that intelligence is not a crisp concept, but a term of value.[4] It has been argued by Gardner, Sternberg, and others that intelligence rests on an individual's capacity to diagnose and respond to their environment and cannot be based on a single notion of general intelligence or *g* as described by Binet in the early 1900's.[2,5-13] It has been noted that IQ and other scholastic tests are poor predictors of success in the "real world" because they focus too much on logic and language and ignore other important abilities in determining success.[2,10] Some of these other contributors to success include the ability to adapt and respond to novel situations that arise in one's context,

recognizing changing and shifting variables within different contexts, problem solving, and leveraging influence (e.g., knowing when it is appropriate to leave a certain situation or to stay and try to change it).[3,5-9,10-12]

Gardner challenges this one-dimensional measure of intelligence by presenting a different intelligence framework called a "theory of multiple intelligences."[2,5,9] Multiple Intelligence (MI) theory recognizes and acknowledges that people have different cognitive (or intellectual) strengths and weaknesses and is based on how individuals develop the skills important to their way of life. The theory of MI is framed around the understanding that intelligence is an innate ability to process information important to one's specific cultural setting and to solve problems or generate ideas that are of value in a certain culture.[9] Multiple intelligence theory is centered on the premise that there are many different types of talents or knowledge that could help to enhance one's life and respond successfully to one's context. Table 1 is a description of Gardner's nine multiple intelligences and their high-end states (i.e., occupations and professions where these intelligences tend to be dominant).

Table 1. Gardner's Multiple Intelligences

Intelligence	Definition	High-End States
Verbal-Linguistic	The ability to use languages effectively to accomplish certain goals.	Lawyers, Speakers, Poets, Writers
Logical-Mathematical	The capacity to analyze problems using logical reasoning and problem solving.	Mathematicians, Scientists, Logicians
Musical	Contains skill in performance and the emotional aspect of sound.	Musicians, Composers, Singers
Kinesthetic	Entails using one's body for both expressive and to solve problems.	Athletes, Actors, Artisans
Spatial	The ability to recognize and manipulate the visual aspects of the world.	Pilots, Sculptors
Intrapersonal	The capacity to recognize one's own desires, fears, and capacities.	Novelists, Therapists, Teachers
Interpersonal	The capacity to understand the intentions, motivations, and desires of other people.	Political Leaders, Counselors, Psychologist
Naturalist	Exhibits recognition for living and natural things.	Farmers, Gardeners, Hunters, Biologists
Existential	The capacity to locate oneself with respect to the furthest reaches of the cosmos and the related capacity to locate oneself with respect to such existential features of the human condition.	Philosophers, Religious leaders

It is necessary for athletic training educators to understand what MI theory is, including how it is different from learning styles (LS). Research on MI theory in athletic training education is important because understanding the dominant *intelligences* of athletic training students can significantly inform ongoing didactic and clinical education. Unless athletic training educators understand that these are not synonymous concepts, there is a danger of misappropriating MI and LS research. The key difference between LS and MI theory is that MI stresses the need to change assessment and demonstration of knowledge to capitalize on students' abilities, whereas the LS suggest changing instruction to capitalize on students' learning styles.[14] In other words, MI addresses what is taught (the content and the product); LS addresses *how* it is taught (the pedagogical process).[14] Learning styles are concerned with techniques used by the instructor during the learning process itself or how information is delivered to certain students, whereas MI centers on the content that is delivered (and not the technique of delivery) and the resulting actions students take to apply the content delivered. In most cases, an LS focus encourages instructors to tailor their teaching technique or pedagogy to individual students. This can be very cumbersome for instructors, especially when delivering large amounts of content or when there are time constraints (e.g., such as is in competency-based clinical education). Another difficulty in having a LS focus is that the pedagogical background of many university instructors is limited. Multiple intelligence offers a solution for instructors who are clinical specialists with no or little training in pedagogy to still maximize learning outcomes of diverse students.

MI theory has gained significant recognition especially in the primary and secondary school settings.[15] For example, research has suggested that post assessment of eighth grade math students exposed to instruction based on MI models show considerable increase when compared to those taught using traditional instruction models.[16] The available research on MI in higher education is considerably less. However, Barrington argues that MI is an inclusive pedagogy that could better inform teaching and learning in higher education.[15] Given the increasing diversity of students within universities, it becomes difficult to develop pedagogy's capability of equally addressing the diversity of learning needs; therefore, multiple intelligence offers an "especially useful and relevant" way to teach in Western higher education institutions.[15] Nursing literature claims that multiple intelligences "provides a conceptual framework for designing classroom activities that promote an interactive learning environment and energize the nursing lecture," in part because the content becomes the focus and the student can then apply what they are learning in a manner that most meaningful and useful to them.[17] However, there is virtually no empirical evidence that explores MI in higher education and no literature at all is available on MI in athletic training education. It is plausible that implementing multiple intelligence theory into athletic training education may enhance pedagogy and improve student outcomes. However, before holistic pedagogies can be developed for higher education and more specifically athletic training education that incorporates MI theory, it is necessary to conduct introductory exploratory research that describes and frames the phenomenon. Therefore, the purpose of this study is heuristic in nature intended to introduce MI theory into athletic training education dialogue by describing the multiple intelligence profile of athletic training students and determine if there are differences in their intelligences based on selected demographic criteria. In addition, this study will raise questions based on the multiple intelligence profile of a selected sample of athletic training students. Therefore, the following research questions were generated:

1. What is the multiple intelligences profile of athletic training students?
2. Are there differences in dominant intelligence relative to the athletic training students' semester in school, age, ATEP level, gender, and ethnicity?

Answering these questions is important for athletic training educators because it describes the student population in a new and meaningful way that has previously not been identified and may offer additional insight into the nature of the athletic training student's behavior, academic performance, clinical performance, and motives within an athletic training context.

METHODS

Participants

Eighty-five athletic training students from two different universities were invited to participate in this investigation, and all 85 (100%) agreed to participate. Carnegie classified both universities as RU/H: Research Universities (high research activity). All participants were students actively enrolled in a CAATE-accredited (Commission on Accreditation of Athletic Training Education) athletic training education program (ATEP). Students who were not formally accepted into their university's ATEP were not invited to participate. Participants were informed as to the voluntary nature of the study and that they could withdraw from the study at any time without penalty. Participants were also ensured as to the anonymity of their responses. The study was approved through the university Human Subjects Review Board.

Instrument

The Multiple Intelligences Inventory (MII) developed by McKenzie was used to identify the intelligences preferred by the athletic training students in this study because of its consistent use in scholarly literature.[18-26] The internal consistency of the MII has been reported by other researchers to range between 0.85 to 0.90.[26-28] The instrument contains nine separate subscale sections, each one representing one of the nine intelligences. Each subscale contains ten dichotomous statements, which participants could report as "accurately describing" them (coded as 1) or as "not describing" them (coded as 0). By totaling the scores for each section, the participant's perception of their dominant intelligence can be identified (scale 0-10). Demographic data (Table 2) was also collected for each participant including age, ethnicity, gender, year in school (i.e., sophomore, junior, senior), and ATEP-level (i.e., semester in ATEP).

Data Collection Procedures

The MII was administered to the participants during their regular athletic training course time. The MII was distributed to the athletic training students, and instructions were given on how to fill out the necessary information. The researchers and the clinical instructor then left the classroom and waited in a nearby classroom during the allotted survey time to ensure anonymity of research participants. Approximately 20 minutes were given for the students to complete the survey. Once the survey was completed, the students placed the finished material in a manila envelope located in the front of the classroom. One student was responsible for informing the researchers and clinical instructor when all participants were finished completing the survey. The researcher then collected the completed surveys for data analysis.

Data Analysis

The researcher tallied and hand scored the participants responses. The data was analyzed using Statistical Package for the Social Science (SPSS 19.0). Descriptive statistics and frequency distributions were used to report athletic training students' demographic (Table 2) and multiple intelligence profiles (Table 3, Figures 1-2). To determine if the differences in dominant intelligences were relative to the ATS' semester in school, ATEP-level, age, and ethnicity, an ANOVA with a Tukey Post Hoc was used, and differences in sex were compared using independent samples *t*-test (p=.05). Paired samples *t*-tests were used to compare mean differences between the intelligences. Cronbach's alpha was used to report internal consistency of the MII.

RESULTS

Demographics

Eighty-five (85) athletic training students from two different universities participated in the study. Data from all 85 respondents were analyzed for these results. Females accounted for 58% (n=49) of the athletic training student responses, and males accounted for 42% (n=36). The mean age of the respondents was 21 ± 1.9 years with a range of 19 to 32 years of age. Seventy-six students were Caucasian (92%), 2% were Asian American, 2% were African American, 2% were Latino and 1% was unspecified. Twenty-six percent (n=22) of the undergraduate students were sophomores, 38% (n=32) were juniors, and 37% (n=31) were seniors. Forty percent (n=34) of the students were in their second semester, 18% (n=15) were in their third semester, 19% (n=16) were in their fourth semester, and 24% (n=20) were in their fifth or higher semester. Table 2 lists the demographic profile of the participants. Coefficient alpha for the MII was α=.85, establishing acceptable internal consistency of the instrument.

Table 2. Demographic Profile of Students (N=85)

	% Distribution (N)	Mean	Median (range)
Age		21 ±1.9	21 (19-32)
19	12.84% (11)		
20	27.06% (23)		
21	30.59% (26)		
22	15.29% (13)		
≥ 23	10.59% (9)		
Unreported	3.53% (3)		
Ethnicity			
Asian American	2.4.35% (2)		
African American	2.35% (2)		
Latino	2.35% (2)		
Caucasian	89.41% (76)		
Unreported	3.53% (3)		
Gender			
Male	42% (36)		
Female	58% (49)		
Year in school			
Sophomore	26% (22)		
Junior	38% (32)		
Senior	36% (31)		
Semester in ATEP			
2nd	40% (34)		
3rd	18% (15)		
4th	19% (16)		
≥5th	24% (20)		

RQ1: What is the multiple intelligences profile of athletic training students?

Kinesthetic intelligence was significantly higher than the other eight intelligences, *t*(84)=4.2 to 16.6 (p=.000) and the highest rated (M=8.0±1.6) and was the most frequently reported (39%) intelligence among the athletic training students. *Intrapersonal intelligence* was significantly higher than the remaining seven intelligences; *t*(84)=3.4 to 11.2 (p=.001) and the second highest (M=6.9±2.2), with 26% of students rating it as their dominant intelligence.

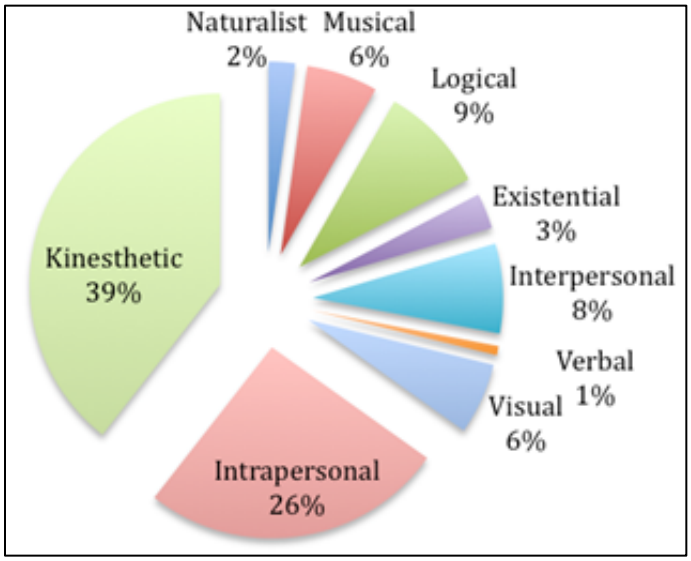
Verbal-linguistic intelligence was significantly lower than the other eight intelligences, t(84)= -4.0 to -16.6 (p=.000) and the lowest rated intelligence (*M*=3.9±1.8). Means and standard deviations for each intelligence are delineated in Table 3. Figure 1 displays the frequencies of dominant intelligences as identified by the ATS.

Table 3. Means and Standard Deviations for Each Intelligence

Intelligence	Mean +/-SD (scale 0-10)
Kinesthetic†	8.0±1.6
Intrapersonal*	6.9±2.2
Logical	5.9±1.9
Interpersonal	5.9±1.8
Visual	5.4±2.2
Musical	5.5±1.8
Existential	5.1±2.0
Naturalist	4.7±2.1
Verbal-linguistic**	3.9±1.8

† significantly higher than all other intelligences (*p*=.000)
* significantly higher than the remaining 7 intelligences (*p*=.001)
** significantly lower than the all other intelligences (*p*=.000)

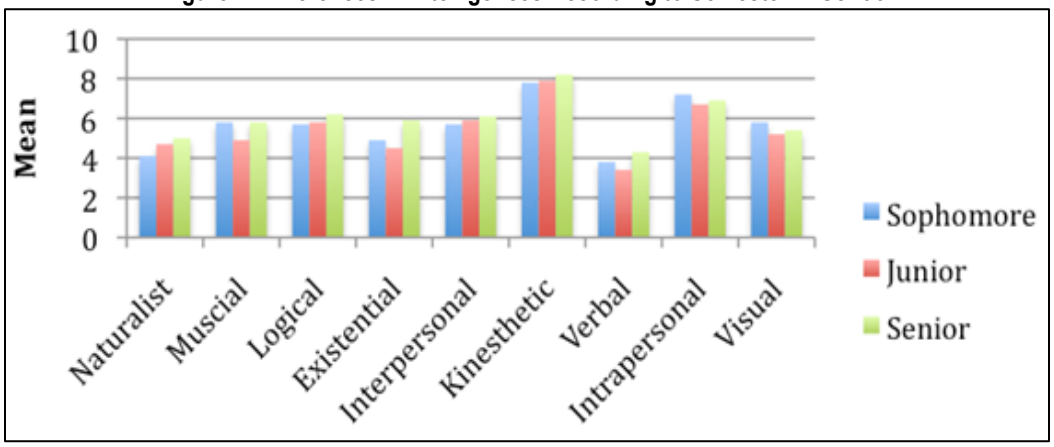
Figure 1. Frequencies of Dominant Intelligence Among ATS



RQ2: Are there differences in dominant intelligence relative to the athletic training students' semester in school, ATEP level, gender, age, and ethnicity?

One-way ANOVA comparisons with Tukey post hoc comparisons found no significant differences ($p \geq .05$) in dominant intelligences between ATS according to ATEP-level, age, or ethnicity. With only one exception, there were no differences between intelligences based on semester in school. *Existential intelligence* was different between ATS's in their third and fifth (or higher) semesters, $F_{(3,81)}=3.26$ ($p \leq .03$), as would be excepted the same difference was noted between juniors and seniors (classifications related to semester), $F_{(2,82)}=4.62$ ($p \leq .013$). No other differences were found between any semesters for any of the other intelligences. Independent samples *t*-test did not find any significant differences ($p \geq .05$) in MI between genders. Although not significant, the largest difference between genders was with verbal-linguistic intelligence, females rated themselves more highly (*M*=4.06±1.8) compared to males (*M*=3.56±1.9). Figure 2 displays the means for all the intelligences by year in school.

Figure 2. Differences in Intelligences According to Semester in School



DISCUSSION

The primary purpose of this study was to identify and describe the self-reported multiple intelligence profiles of athletic training students (ATS), and determine if there are differences in their intelligences based on demographic criteria. A majority (65%) of ATS who participated in this study believed that either *kinesthetic* or *intrapersonal* intelligence was their dominant intelligence, with kinesthetic reported by 39% as their top intelligence. *Verbal-linguistic* intelligence was rated as the lowest intelligence by ATS's. Although slight variances were observed, there were no significant differences in the types of intelligences reported based on the student's age, ATEP-level, gender, or ethnicity. Only *existential intelligence* was different between juniors and seniors.

The implications of these findings for athletic training education extend beyond their heuristic value. While these findings do raise important questions for athletic training educators, such as; how might multiple intelligence – centered frameworks facilitate student outcomes over and above learning style – centered frameworks; and given the similarities in multiple intelligence profile between genders, ages, and student's academic levels, what are the primary contributors to athletic training students dominant intelligences?

Kinesthetic Intelligence

The prevalence of kinesthetic intelligence among athletic training students supports Draper's finding that athletic training students are kinesthetic (i.e., hands-on) learners.[29] The results also support Coker who found that athletic training students preferred to learn via active experimentation.[30] With these findings, the kinesthetic construct, as a mode athletic training students use to acquire and apply information, is supported from two different conceptual frameworks (i.e., learning style models and intelligence/cognitive models). When considered as a whole, these data suggest that the kinesthetic intelligence may be an inherent trait of individuals predisposed to select athletic training as a major. This finding has implications for athletic training education program selection committees who may use it as a selection criteria for potential athletic training students, presumably to increase the students' probability of success or as a way to ensure there is a greater diversity of intelligences represented within student groups by selecting those who do not have kinesthetic intelligence as their dominant intelligence type.

Furthermore, the implication for athletic training educators raises significant questions about the relationship between pedagogy and student outcomes. For example, what is the best way to support students with kinesthetic intelligence, should educators focus on learning styles and therefore adjust their teaching techniques and methods to favor the dominant style of a majority of students and therefore neglect the minority of students who do not have that particular learning style; or should educators focus more on the content of their courses (of which they are probably more comfortable and familiar) and allow each student to apply that content according to their dominant intelligence type?

The reasons why athletic training students report higher levels of kinesthetic intelligence are also interesting to consider for future research. If intelligence is determined by the value of a certain behavior within different cultures, it may be that kinesthetic intelligence is high in athletic training students because of the value placed on that ability by athletic training "culture;" a culture that has its history in physical education, physical therapy, and sport. It has been reported that many athletic training students became interested in the athletic training profession due to previous experience or an association with sports and athletes.[31-32] Furthermore, athletic trainers need to carry out well-executed movements and fine motor skills to demonstrate clinical proficiency and evaluation techniques, which necessitates kinesthetic intelligence. This need for clinical proficiency is typically recognized by students early in their athletic training education and may also facilitate the student's perception of the importance of kinesthetic

intelligence. Whether or not athletic training students enter into ATEP's already "kinesthetically intelligent" because of the sports or clinical culture or whether they develop it out of cultural/professional necessity is an important question to be answered by future research.

Intrapersonal Intelligence

Intrapersonal intelligence was the second highest rated intelligence (26%) among the athletic training students in this investigation. This type of intelligence suggests that athletic training students may play a larger role in their own sense of success and confidence than might initially be realized. It is used as a basis for understanding who we are, what makes us tick, how we can change ourselves in light of the constraints on our abilities and interests.[33] Intrapersonal intelligence is likely to play a role in self-confidence and an individual's sense of success. The finding that intrapersonal intelligence is relatively high in ATS's can be expected given the selective and competitive nature of admission into many athletic training educational programs and has implications into personality research of athletic trainers and students. Other implications of this finding for athletic training educators is that clinical-based or hands-on evaluations in clinical settings may have greater and more positive impact on student performance than standardized evaluations such as graded exams and essays.

This finding contributes to the dialogue of Cernohous and West who found that repeated exposure to the environment and situation could help build athletic training students' confidence.[34] It may be that the clinical education model (i.e., learning over time) used by CAATE-accredited ATEPs facilitates intrapersonal intelligence and helps to explain other athletic training research that suggests contextual intelligence, an important skill for athletic trainers, requires a strong sense of intrapersonal awareness.[12,35,36] Of significance is that the reporting of high intrapersonal intelligence contributes a possible explanation to other empirical research within athletic training as to why contextual intelligence has been found to be a "very important" aspect of athletic training and why other clinical professions (i.e., nursing) believe it to be a core competency for leaders.[36-37]

Individuals with high *intrapersonal intelligence* may be better equipped to apply Sternberg's internal aspect of intelligence, which includes three-steps: 1) sorting through and sifting out relevant from irrelevant information, 2) selectively combining and integrating partial information to form a plausible whole, and 3) relating and connecting new information to information already learned.[38] Therefore, having higher levels of *intrapersonal intelligence* may help athletic training students successfully navigate the rigors of learning over time by internally applying these three steps successfully. Since learning over time is a major component of athletic training education, athletic training educators could use multiple intelligence profiles in their selection of which students to admit into athletic training education programs or to help identify students who may have difficulty with learning over time.

Verbal – Linguistic Intelligence

Verbal-linguistic intelligence was the lowest intelligence among the athletic training students. This finding suggests that athletic training students in general may have difficult time using or applying information that is evaluated in traditional classroom manners, such as written exams, or recalling and reciting specific terms or definitions on tests.[2] Athletic training educators typically evaluate or rank knowledge of students based on some level of standardized testing. This finding indicates that this strategy may not be the most appropriate. Dialogue in athletic training education should continue to investigate other ways to assess an athletic training students' conceptual knowledge. The implications of the gap between verbal-linguistic and kinesthetic intelligences in athletic training students adds empirical evidence to the discussion why there may be a disconnect between didactic and clinical education.

Other Implications for Educators

Previous research on learning styles (not MI) in athletic training refer to clinical versus didactic education and how faculty should adjust their teaching based on how student's learning style changes in these different contexts.[29,30] The implications of this study are much different. In this case, some of the responsibility rests on the students to adjust to their current culture (i.e., act intelligently). While it is certainly warranted that faculty include holistic pedagogy within the student population, it is equally as warranted that students be able to apply other intelligences to enhance their learning experience. For example, students with high kinesthetic intelligence may be less likely to make important conceptual connections or applications with material in didactic learning settings. Therefore, faculty may have to help ATS develop other lower rated intelligences.

It has already been demonstrated that many athletic trainers are former athletes and sports enthusiasts, which may explain why kinesthetic intelligence was high.[31-32] Therefore, one recommendation from these findings can be to recruit students from backgrounds and experiences that are more diverse or from groups who perhaps value kinesthetic intelligence less. It is possible that having a greater diversity of intelligences among athletic training students may serve to increase the innovation and global impact of the profession. Of note is the finding that there were virtually no differences between athletic training student's

intelligences based on gender, age, ATEP-level, semester in school, or ethnicity. Since ethnicity was not diverse in this sample the absence of a difference is not surprising. However, it is noteworthy that the distribution of the diversity in this sample was nearly identical to the diversity distribution of athletic training professionals.[39] Therefore, this is not as great a threat to external validity. This lack of significant differences in intelligences among this sample implies that the intelligences are based on other factors than ethnicity, gender, age, number of years in school, or time as an ATS. I suggested previously the similarity may be due to the common sports culture shared by many athletic training students.

Future Research and Limitations

Even though significant differences were not observed between ATS's in this study, additional research is needed to investigate how the nine intelligences are developed and reinforced among identifiable groups. For example, intelligence profiles should be measured across the different types of athletic training education (e.g., entry-level, post-professional, and doctoral-level). Future studies also should measure intelligence preference over more widely dispersed groupings (i.e., larger age group ranges at different levels of education or in different work settings).

The convenience-sample and sample size is a threat to the external validity. However, it has been demonstrated that if respondents are from a homogenous group that represents the sample, results are still generalizable to a larger population.[40] Future studies should still use a broader range of athletic training students in order to establish consistency among dominant intelligences. Another limitation was that the MII instrument captured only self-reported data. While it was not the intent of this study to examine outcomes of MI theory on athletic training education, the current investigation was exploratory and descriptive and did not investigate the outcomes of introducing MI theory into teaching or learning athletic training material. Therefore, future studies on multiple intelligence should investigate how the unique aspects of competency-based clinical education (e.g., teaching style, learning over time, clinical competency and proficiency) might be affected by MI specific pedagogy in athletic training education.

CONCLUSION

Multiple Intelligence theory identifies nine intelligences and suggests that each human being has a unique array of these intelligences with some being more dominant than others. *Kinesthetic* and *intrapersonal intelligences* were reported to be significantly higher and used most frequently by athletic training students. *Verbal-linguistic intelligence* was reported to be the lowest and least frequent. These findings suggest that athletic training students apply learned knowledge best when allowed to practice hands-on skills and work independently in order to build self-confidence. By understanding ATS's intelligence preferences, athletic training educators may be better able to introduce curricular and clinical experiences that enhance the acquisition and application of knowledge in both, clinical and classroom settings.

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KEY TERMS
Intelligence, Kinesthetic, Learning