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Critical-thinking disposition and profile of critical-thinking disposition for postprofessional graduate athletic training students

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CRITICAL-THINKING DISPOSITION AND PROFILE OF CRITICAL-THINKING DISPOSITION FOR POSTPROFESSIONAL GRADUATE ATHLETIC TRAINING STUDENTS

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Dissertation Abstract

Critical-thinking Disposition and Profile of Critical-thinking Disposition for Postprofessional Graduate Athletic Training Students

Critical-thinking disposition, a component of clinical judgment, is cited as a necessary trait in the field of athletic training. Currently, information and evidence does not exist that measures critical-thinking disposition for graduate-level athletic training students. The purpose of this study was to measure critical-thinking dispositions of postprofessional graduate athletic-training students and to establish a critical-thinking disposition profile of graduate athletic-training students in all accredited postprofessional graduate athletic-training programs in the US using the California Critical Thinking Disposition Inventory (CCTDI).

Seven out of the 16 postprofessional graduate athletic-training programs agreed to participate in the current study. The CCTDI was administered to 137 first- and second-year postprofessional graduate athletic-training students during the beginning of the Spring 2010 semester. Upon gathering of these CCTDI overall and subscale means, the CCTDI data were related with the following variables to ascertain whether or not relationships exist: age, GPA, gender, certified or noncertified at the time of the inventory, number of times needed to pass the BOC athletic training certification exam, first- or second-year graduate students, and number of years as a certified athletic trainer.

This current study derived a critical-thinking disposition profile for graduate athletic-training students. Every subscale revealed a positive disposition toward critical-

thinking disposition with the exception of truth-seeking and openmindedness with inquisitiveness achieving the highest overall mean. Overall, a majority of graduate athletic-training students had scores within the positive range as measured by the CCTDI. Additional variables investigated included age, gender, year in the graduate program, certification status, number of years certified, and number of attempts needed to pass the BOC examination, and all revealed weak to no relationship to the CCTDI and associated subscales. No statistical significance was obtained for any variables examined.

The results of this study suggest that graduate athletic-training students apply critical-thinking disposition but demonstrate ambivalence toward truth-seeking and openmindedness. Instructors should be aware and work to promote these two attributes when instructing students in didactic and clinical situations. In addition, graduate students should identify opportunities to seek a deeper understanding of information and be open to ideas or opinions that may differ from their own.

This dissertation, written under the direction of the candidate's dissertation committee and approved by the members of the committee, has been presented to and accepted by the Faculty of the School of Education in partial fulfillment of the requirements for the degree of Doctor of Education. The content and research methodologies presented in this work represent the work of the candidate alone.

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CHAPTER I

INTRODUCTION

Clinical judgment is an essential component for healthcare practitioners to be successful in a complex healthcare field (Pew Health Professionals Commission, 1995). Accreditation agencies and researchers in the healthcare fields believe that producing practitioners proficient in exercising sound clinical judgment is essential to the advancement of their respective professions and competent clinicians (Commission on Accreditation of Athletic Training Education, 2008; Commission on Accreditation in Physical Therapy, 2006; Jackson, Ignatavicius, & Case, 2006; National League for Nursing Accrediting Commission, 2002). Clinical judgment is defined as "the development of opinions in the clinical practice setting, based on experience and knowledge, to guide the decisions you will make regarding the care of a patient" (Jackson et al., 2006, p. 14). Because clinical judgment is complex and comprised of many different cognitive, affective, and experiential components, measurement of a practitioner's clinical-judgment abilities has been problematic (Daly, 1988; Lasater, 2007; Tanner, 2006).

Currently there are over 7.5 million athletes participating in high-school sports and approximately 380,000 athletes participating in collegiate sports in the US with the frequency of injuries rising because of the increasing number of participants (The National Federation of State High School Association, 2009; National Collegiate Athletic Association, 2006). Athletic trainers are in the position of first responders at athletic events and can identify and quickly provide the appropriate care for injuries such as concussions, sudden cardiac death, or spinal cord injuries. Football participation has the

highest incident of injury among all the high-school and collegiate sports (Yard & Comstock, 2008). The annual survey of football research reported that 18 athletes died from football-related activities in 2009 (Meuller & Colgate, 2010). Football is not the only sport whereby catastrophic injuries can occur. Between 1994 and 2006 approximately 1,290 athletes died from sudden cardiac arrest (Maron, Doerer, Haas, Tierney, & Mueller, 2009), and it is estimated that 400,000 concussions occur annually in high school sports with a majority returning to athletic competition prior to a complete recovery (Yard & Comstock, 2009). With participation of sports on the rise in the US, appropriate medical care needs to be available to prevent and mitigate the severity of potentially life-threatening injuries (Anderson, Courson, Kleiner, & McLoda, 2002). Athletic training is no different than other healthcare fields wherein sound clinical judgment is paramount to performing everyday duties and failure to exercise sound clinical judgment can lead to catastrophic consequences (Colt, 2007).

Critical-thinking disposition, a component of clinical judgment, is cited as a necessary trait in healthcare fields such as nursing (Bandman & Bandman, 1988; Benner, 1983; Tanner, 2006), physical therapy (Bartlett & Cox, 2000, 2002), occupational therapy (Lederer, 2007), pharmacology (Miller, 2003), and athletic training (Knight, 2008; Leaver-Dunn, Harrelson, Martin, & Wyatt, 2002). The California Critical Thinking Disposition Inventory (CCTDI) has been used to assess characteristics related to critical-thinking disposition in nursing, physical therapy, pharmacology, and athletic training (Bartlett & Cox, 2000, 2002; Colucciello, 1997; Facione & Facione, 1997; Ip et al., 2000; Leaver-Dunn et al., 2002; Leppa, 1997; Profetto-McGrath, 2003; Racchini, 2007; Tiwari, Avery, & Lai, 2003; Yeh & Chen, 2003).

Studies in the field of nursing have suggested a linear relationship exists between critical-thinking disposition and a practitioner's knowledge and experience that are both considered to be related to clinical judgment (Martin, 2002; Wilgis & McConnell, 2008). Jackson et al. (2006) posited that improving critical-thinking disposition will lead to better clinical reasoning, which in turn will lead to sound clinical judgment. Clinical reasoning is the process in which a clinician utilizes data and other objective information about a disease, injury, or illness leading to a conclusion regarding the meaning of the information (Jackson et al.). Clinical judgment is the opinion attained from the clinical reasoning process that guides a clinician's decision about proper care for a patient (Jackson et al.). Lasater (2007) suggested that healthcare professionals must possess high-level decision-making skills (clinical judgment) to manage ill-defined clinical situations. Furthermore, healthcare professionals must interpret both objective and subjective data (clinical reasoning) and then determine an appropriate course of action (clinical judgment) all in a short period of time (Benner, 1983; Tanner, 2006).

Developing critical thinking provides the foundation for enhancing practical and theoretical knowledge needed in the healthcare field to become an effective practitioner (Tanner, 2006). The development of critical thinking occurs at the undergraduate level through traditional didactic classroom instruction and through clinical experiences and is further advanced through graduate-level education. Knight (2008) posited that athletic training is no different from other professions in that teaching critical thinking is an outcome of a solid undergraduate and graduate education. Knight continued by stating that the process for fostering and nurturing critical-thinking dispositions in undergraduate and graduate programs are not meeting the goal of developing critical thinking. Radke

(2008) offered a number of reasons that the athletic-training education process for developing critical thinking is being stifled. She posited four challenges facing the field of athletic training. The first area is an increase in didactic learning instead of clinical experiences. The second is viewing clinical experiences as work experience and not as authentic classroom experiences. The third is that clinical instructors are inhibiting the ability to allow students to make autonomous decisions. Finally, clinical instructors are limiting access to challenging clinical situations in which students are able to utilize appropriate critical-thinking skills (Radke). So, the logical question from these challenges is how should programs measure or assess the efficacy of teaching critical-thinking disposition to professionals entering the field of athletic training, or more importantly, how does the field of athletic training assess professional competency?

In the field of athletic training, studies typically measured professional competency by certification pass rates (Turocy, 2002). Although these high-stakes tests measure theoretical knowledge, they do not provide insight into one's ability to apply that knowledge in more authentic clinical situations (Racchini, 2007). In other fields such as nursing, it has been asserted that critical-thinking disposition is necessary to pass exams like the National Council Licensure Examination for Registered Nurses (NCLEX-RN; Wendt & Brown, 2000). This assertion has been supported by studies suggesting that critical-thinking dispositions are correlated with passing the NCLEX-RN (Facione & Facione, 1997; Giddens & Gloeckner, 2005; Hall, 1996). Colt (2007) found a statistically significant relationship ($t[122] = 2.61$, $\acute{\eta}^2 = .05$) between critical-thinking skills and passing rates on the National Athletic Training Association Board of Certification Examination (NATABOC) and yielded a medium measure of practical importance.

If in fact critical thinking has been identified as a component for successfully passing high-stakes testing in other professions, thought to be a measure of professional competency, would it not be reasonable to suggest that it is necessary for success on the Board of Certification (BOC) athletic training examination?

Critical thinking has been studied extensively in the field of nursing at the undergraduate and graduate levels (Colucciello, 1997; Facione & Facione, 1997; Giancarlo & Facione, 2001; Girot, 2000; Hicks, Merritt, & Elstein, 2003; Kawashima & Petrini, 2004; McCarthy, Schuster, Zehr, & McDougal, 1999; Tiwari et al., 2003; Walsh & Hardy, 1999; Yeh & Chen, 2003). In the field of athletic training, there has been only one published cross-sectional study investigating critical-thinking disposition of undergraduate students. This study by Leaver-Dunn et al. (2002) revealed no difference between students in sophomore through senior years in the program, but Facione and Facione (1997) suggested that measurable change on assessment instruments, such as the CCTDI, may not be attained until students enter graduate studies or after some time practicing in the clinical field and after years of experience is gained. Therefore, the next logical question would be do graduate students have higher scores on average on the CCTDI than undergraduate athletic-training students?

Currently, information and evidence does not exist that measures critical-thinking disposition for graduate-level athletic training students. A critical-thinking disposition profile currently exists for graduate-level nursing students on the CCTDI who demonstrate higher means relative to their undergraduate counterparts (Facione & Facione, 1997). These results were supported by Phillips, Chesnut, and Respond (2004), Miller (2003), and Lederer (2007) who all found higher means on the overall CCTDI and

associated subscales for the CCTDI. When compared with studies that used the CCTDI with undergraduate students, graduate students record, on average, higher overall and subscale means on the CCTDI (Seldomridge & Walsh, 2006).

A previously published study in the field of athletic training with undergraduate students by Leaver-Dunn et al. (2002) investigated whether or not variables such as age, gender, ethnicity, year in the athletic-training program, grade point average (GPA), completed semester hours, or clinical rotation semester hours completed are related to critical-thinking disposition. Leaver-Dunn et al.'s results indicated no statistical significance in any of the aforementioned variables and CCTDI results, but the sample size was small (n=91), and these were undergraduate students. Similar nonsignificant results were attained by other researchers investigating the same variables in other healthcare fields for undergraduate students (Facione & Facione, 1997; Lederer, 2007; Phillips et al., 2004).

Purpose of the Study

The purpose of this study was to measure critical-thinking dispositions of postprofessional graduate athletic-training students and to establish a critical-thinking disposition profile of graduate athletic-training students in an accredited postprofessional graduate athletic-training program using the California Critical Thinking Disposition Inventory (CCTDI). This profile was comprised of an overall CCTDI score and all seven subscales: truth-seeking, open-mindedness, analyticity, systematicity, critical-thinking self-confidence, inquisitiveness, and cognitive maturity.

The CCTDI was administered to first- and second-year postprofessional graduate athletic-training students in the United States during the beginning of the Spring 2010 semester. Upon gathering of these CCTDI overall and subscale means, the CCTDI data were related with the following variables to ascertain whether or not relationships exist: age, GPA, gender, certified or noncertified at the time of the inventory, number of times needed to pass the BOC athletic training certification exam, first- or second-year graduate students, and number of years as a certified athletic trainer.

Background and Need for the Study

A major challenge for educational programs such as nursing, physical therapy, and athletic training is to produce professionals in the field of healthcare who are critical thinkers, who can solve problems, who are committed to learning over a lifetime, and who possess sound clinical judgment (Heinrichs, 2002). In the field of athletic training, this assumption is further supported by Leaver-Dunn et al. (2002); however, there are no further data to address this assumption in the field of athletic training.

Recognized by the American Medical Association as a healthcare professional, an athletic trainer is a specialized healthcare provider whose scope of practice includes, but is not limited to, assessing and treating acute injuries, prevention of athletic-related injuries, providing rehabilitative services to injured athletes, organization and recordkeeping of injuries and treatment protocols, and educating parents, athletes, coaches, and the general public in sports medicine-related issues. Athletic trainers work with all populations from professional athletes to general populations and in a wide range of settings. These setting include professional, college, high school, or physical therapy clinics. Athletic trainers are typically the first responders for emergency care for athletes.

Because athletic trainers are considered first responders for emergency care, they are in a unique position of expediting care, mitigating the impact of an injury, or intervening in the outcome of a severe or life-threatening injury.

In 2005-2006, the Center for Research Injury and Policy conducted a national study investigating injury frequency, types, body part affected, and severity of injuries, and various demographics such as when an injury occurred and the mechanism of the injury (Yard & Comstock, 2008). These results suggested that an estimated 1.4 million injuries are sustained by secondary-school athletes every year. Of these injuries, it is estimated that approximately 400,000 of the injuries sustained by secondary-school athletes are concussions (Yard & Comstock, 2009). In addition, since 1994 approximately 1,260 athletes under the age of 39 died because of a heart-related incident while participating in an athletic event (Maron et al., 2009). The 2009 annual survey of catastrophic football injuries recommends that every institution employ a full-time certified athletic trainer to assist in preventing and providing immediate care for traumatic sports-related injuries (Mueller & Cantu, 2009). Because of the potential for catastrophic injuries in sports, there is an equal need for competent individuals who possess the necessary abilities to apply critical thinking and to exercise sound clinical judgment to ensure the best possible care in emergency situations.

Since 1994, the profession of athletic training has evolved from a general physical education degree to a specialized professional degree in athletic training (Delforge & Behnke, 1999). The path by which athletic trainers are educated (internship vs. curriculum), certified, licensed, prepared for entry-level employment through undergraduate accredited programs, and completed postprofessional graduate education

have all become standardized between 1994 and the present (Rich, Kedrowski, & Richter, 2008).

The Commission on Accreditation of Athletic Training Education (CAATE), formerly known as The Joint Review Committee on Educational Programs in Athletic Training (JRC-AT), is responsible for the accreditation of 365 undergraduate and graduate athletic-training programs in the United States. CAATE is charged with ensuring quality standards including objective, academic requirements, and outcome for evaluation of undergraduate athletic training accredited programs. These standards are designed to ensure a minimum level of competency for an entry-level athletic trainer and eligibility for the Board of Certification (BOC; CAATE, 2008).

An undergraduate education is grounded in three didactic areas: (a) cognitive, (b) psychomotor, and (c) clinical proficiencies. Students are taught most of their critical-thinking skills, decision-making skills, and skill application in the clinical setting (National Athletic Training Educational Council, 2009). Additionally, post-professional graduate athletic training programs (PPGATP) have identified critical-thinking skills and attributes as necessary components of a graduate athletic trainer's education (National Athletic Training Educational Council, 2009). These attributes are in line with recent trends in other healthcare fields, specifically nursing and physical-therapy education where critical thinking is a key outcome measure. The National League for Nursing Accrediting Commission (NLNAC, 1999), the National League for Nursing (NLN, 1992), and the American Association of Colleges of Nursing (AACN, 2007) all require that critical thinking be a core competency in nursing-education curricula and measured as an outcome of nursing education. Additionally, the American Physical Therapy

Association (APTA) and the American Board of Internal Medicine (ABIM) both list critical thinking as a core competency at both the undergraduate and graduate levels of study (APTA, 2009; ABIM, 1998).

It is assumed that a strong undergraduate education will nurture critical-thinking abilities (Ennis, 1985). If this statement is true, then the assumption should be that a graduate-level education should continue to reinforce and build upon these critical-thinking abilities attained in undergraduate curricula (Seldomridge & Walsh, 2006). Other professions offering graduate or postprofessional education such as nursing (Facione & Facione, 1997; Facione, Giancarlo, Facione, & Gainen, 1995; Girot, 2000), physical therapy (Bartlett & Cox, 2000, 2002), pharmacology (Phillips et al., 2004), and occupational therapy (Lederer, 2007) have conducted studies to identify critical-thinking disposition in their respective disciplines.

The studies cited in the previous paragraph have focused on many variables that are believed to be associated with critical-thinking disposition. These variables include the following: age (Bartlett & Cox, 2000, 2002; Racchini, 1997), gender (Bartlett & Cox, 2000, 2002; Walsh & Hardy, 1999), grade point average (GPA; Leaver-Dunn et al., 2002; Walsh & Hardy, 1999), years of experience (Bartlett & Cox, 2000, 2002; Lederer, 2007), cross-section and longitudinal data on standardized assessment tools (Bartlett & Cox, 2000, 2002; Colucciello, 1997; Facione & Facione, 1997; Lederer, 2007; Leppa, 1997), licensure or certification status (Facione & Facione, 1997; Rachinni, 2007), success on high stakes testing for licensure or certification (Facione & Facione; Facione et al., 1995; Giddens & Gloeckner, 2005; Rachinni; Stewert & Dempsey, 2005), and salary (Racchini). Their findings have yielded mixed results, but it does appear that the older

someone is the higher overall scores attained on the CCTDI. Additionally, more academically successful students, as measured by undergraduate GPA and passing of high stakes testing such as the registered nurse national licensing certification examination (RN-NLCEX), have demonstrated statistically significant higher overall means attained on the CCTDI (Facione & Facione; Facione et al.; Giddens & Gloeckner; Rachinni; Stewert & Dempsey).

Athletic training, like many other healthcare professions, has identified critical thinking as a necessary component of a graduate athletic trainer's education. Although, critical thinking has been identified as an outcome of a graduate education in athletic training, there currently are no studies that have been conducted to investigate whether or not graduate programs are nurturing, promoting, or developing critical-thinking dispositions.

Significance of the Study

This study was important for three reasons. Because athletic trainers are sometimes primary caregivers for athletes, adolescents, and the general population, their decisions or critical-thinking abilities can have a profound impact on the outcome of the treatment provided. Teaching and developing critical thinking in the traditional didactic and clinical settings become an important aspect of an athletic trainers' education. The results of this study may assist postprofessional graduate athletic training programs in evaluating whether or not they are promoting, fostering, or nurturing students' development of critical-thinking disposition throughout their graduate education.

The second goal of this study was to investigate overall and subscale means on the CCTDI for all postprofessional graduate athletic training students and then compare them with the CCTDI overall and subscales results of graduate nursing students, undergraduate athletic-training students, certified athletic trainers, and investigate if certain demographic information is related. Comparing CCTDI scores with established CCTDI scores from graduate nursing students, undergraduate athletic-training students, and certified athletic trainers may assist educators in elucidating if changes in instruction need to be made to improve critical-thinking disposition relative to other healthcare fields.

Finally, assessing whether or not there was a relationship between critical-thinking disposition, as measured by the CCTDI, and age, undergraduate grade point average (GPA), gender, certified or noncertified at the time of the inventory, number of times needed to pass the BOC athletic training certification examination, first- or second-year graduate students' status, and number of years as a certified athletic trainer. Additionally, results of the CCTDI on graduate athletic-training students were compared with scores of undergraduate athletic-training students and certified athletic trainers. The results can assist students and educators by informing them if select variables have a relation to critical-thinking disposition thereby helping to shape future graduate-level curriculum.

Theoretical Rationale

This section presents the foundation for the relationship between critical-thinking disposition and clinical judgment and athletic training using Perkins, Jay, and Tishman's (1993) dispositional theory model.

Specific clinical judgment in many healthcare professions, such as nursing, physical therapy, medicine, and athletic training, is thought of in a step-wise progression that begins with analyzing the problem at its inception. Some authors have argued that this approach works well when teaching beginner and advanced-beginner nursing students, but this model does not account for the magnitude of the complexity of clinical judgment (Benner, 1983; Lasater, 2007). In athletic training, clinical judgment not only comes from knowledge and experience but also from the athlete's physical, social, emotional, and support resources. The clinician's critical-thinking disposition can have a tremendous impact on the clinical reasoning applied to a given situation to decide on a course of action (Benner). Paul (1993) posited that to become a critical thinker, or even perform the act of critical thinking, one must possess the right attitude or what he called "intellectual traits of the mind" (p. 22). The idea of metacognition is shared by Watson and Glaser (1991) who suggested that not only does attitude play a central role but also subject- or domain-specific knowledge. Additionally, Benner posited that cognitive, affective, and possibly meta-cognitive skills can be improved with both theoretical and practical knowledge.

Perkins et al. (1993) proposed that attitudes or dispositions of critical thinking are based on what they called triadic dispositions that then dictate behavioral tendencies. These three discipline-neutral areas include *inclinations*, *sensibilities*, and *abilities* that are the foundation good thinkers apply to clinical-specific situations. Additionally, Perkins et al. argued that under the three categories aforementioned, seven dispositions need to be present for someone to be characterized as a good critical thinker.

Perkins et al. (1993) suggested that *inclination* to habits or behaviors, perceived *sensitivity* to situations, and the *ability* to act or perform comprise the foundation of critical-thinking disposition. The *inclination* to habits describes how a person's tendencies or feelings toward a specific behavior or action are interpreted. Meaning that if an athletic trainer is inclined to be openminded about a situation, then he or she will be drawn to this specific behavior of openmindedness rather than to a closed-minded behavior. An athletic trainer who is *sensitive* to a specific situation will be cognizant or be perceptive for detecting certain occasions. Sensitivity is demonstrated when a situation demands someone to be openminded, he or she will perceive when bias or prejudice may be likely and openmindedness necessary. The final aspect, *ability*, refers to the act of following through with a specific behavior. An athletic trainer who demonstrates openmindedness can be reserved in acting too quickly without proper analysis or counter arguments to the situation.

Perkins et al. (1993) further described critical-thinking disposition by identifying seven different thinking behaviors that all good thinkers possess depending on the situation presented. These seven dispositions are broad and adventurous, intellectual curiosity, clarify and seek understanding, planful and strategic, intellectually careful, seek and evaluate reason, and metacognition.

Because the Perkins et al.'s (1993) model is a description of behavioral tendencies, it is closely aligned with the behavioral tendencies of the CCTDI (see Table 1). The CCTDI is the first tool created to evaluate and assess the extent to which an individual demonstrates an inclination toward characteristics associated with critical-thinking disposition or the behavior one is inclined to exhibit.

Table 1

Comparison between Perkins et al.'s Disposition Theory and the CCTDI Scales

Perkins et al. (1993)	CCTDI
Broad and Adventurous Intellectual Curiosity Clarify and Seek Understanding Seek and Evaluate Reasons	Truth-seeking
Broad and Adventurous Seek and Evaluate Reasons	Openmindedness
Broad and Adventurous Planful and Strategic	Analyticity
Planful and Strategic Intellectually Careful	Systematicity
Broad and Adventurous Intellectually Careful Seek and Evaluate Reasons	Self-confidence
Broad and Adventurous Intellectual Curiosity Clarify and Seek Understanding Seek and Evaluate Reasons	Inquisitiveness
Clarify and Seek Understanding Intellectually Careful Metacognitive	Maturity

The seven areas assessed by the CCTDI, truth-seeking, openmindedness, analyticity, systematicity, self-confidence, inquisitiveness, and maturity, all share commonalities with Perkins et al.'s (1993) dispositional theory. These commonalities are explored in the following paragraphs.

The first disposition, broad and adventurous, describes the inclination of an individual to examine beyond what is presented. An adventurous person will explore new ideas, interpretations, and push boundaries of current thought. Additionally, a broad and adventurous person is sensitive to narrow perspectives, generalities, and when sound and

logical alternative ideas or viewpoints are presented not discounting them (Perkins et al., 1993). Identifying assumptions, viewing a situation from another's viewpoint, and formulating multiple solutions by brainstorming alternate ideas are all abilities a broad and adventurous individual exhibits (Perkins et al.). Athletic trainers need to process information in a timely manner so proper treatment can be administered but a narrow view or evaluation of a given situation, without evaluating multiple solutions, certain objective or subjective data may be missed thereby affecting proper and expedient treatment. The CCTDI assesses this dimension of critical-thinking disposition through analyticity, truth-seeking, openmindedness, and inquisitiveness.

The next disposition, intellectual curiosity, means that good thinker is inclined to inquiry, probing new problems, and posing questions for further clarity of situations. Individuals who are intellectually curious are sensitive to unasked questions or other hidden anomalies that may not be recognized or easily distinguished in a given situation (Perkins et al., 1993). Some abilities demonstrated include the inclination for close observation and identification of alternate assumptions through persistent inquiry (Perkins et al.). An athletic trainer needs to demonstrate persistent inquiry when questioning an athlete about his or her injury. One who is thorough and complete in gathering information through questioning will have a greater likelihood of correctly evaluating an athlete correctly and not miss any pertinent information that could be detrimental to proper care. Intellectual curiosity is assessed through the subscale of truth-seeking and inquisitiveness on the CCTDI.

The third area of critical-thinking disposition, clarify and seeking understanding, is characterized by the proclivity to connect ideas to past experiences and prior

knowledge. These individuals who seek clarity in understanding demonstrate sensitivity to vagueness, ambiguity, or abstraction (Perkins et al., 1993). Individuals who excel in seeking understanding possess the ability to make analogies and connections to past experiences, thereby helping them by guiding future decisions and provide clarity to objective and subjective details (Perkins et al.). An experienced athletic trainer will gather subjective and objective data from an athlete regarding his or her injury and, along with past experiences, will guide his or her future decisions about treatment and subsequent follow-up care. Clarifying and seeking understanding is defined on the CCTDI by the inquisitiveness, maturity, and truth-seeking subscale.

An individual who demonstrates planful and strategic organization strives to foresee issues that could arise as an outcome of a decision before that decision is made and is the fourth aspect of critical-thinking disposition. Individuals who are planful tend to approach a problem in a step-wise fashion and are sensitive to aimless or directionless thought (Perkins et al., 1993). Possessing the ability to set goals, evaluate alternative approaches to solving problems, and foresight to distinguish possible outcomes are all abilities a planful and strategically disposed person possesses (Perkins et al.). A good athletic trainer will establish a plan of treatment for his or her patient and possess the ability to foresee possible outcomes of his or her treatment after initiating care. Systematicity and analyticity, both subscales on the CCTDI, assesses the planful and strategic dimension of the dispositional theory.

The fifth disposition, being intellectually careful, describes an individual who is precise and thorough in his or her decision making. These individuals are sensitive to the possibility of mistakes, erroneous, or contradictory objective or subjective data (Perkins

et al., 1993). Because individuals are sensitive to inconsistent information, he or she possesses the ability to organize information with precision and to recognize and apply theoretical or intellectual standards to situations (Perkins et al.). Athletic trainers need to possess the ability to organize information in a precise and timely manner and then apply evidence-based treatment for proper care of an athlete. Individuals who are self-confidence, maturity, and systematicity, as demonstrated on the CCTDI, describe individuals who are alert or sensitive to results or consequences of their actions and are organized and diligent when faced with clinical situations.

The next critical-thinking disposition, seeking and evaluating reason, is characterized by an individual who is inquisitive, probing, and is skeptical toward assumptions and bias. These individuals are not satisfied with superficial information, but he or she will seek to uncover or apply meaning to information that is provided (Perkins et al., 1993). These individuals are sensitive to missing information or a superficial understanding of data necessary for making decisions. Individuals who constantly seek and evaluate reason have the ability to process information inductively and weight outcomes of their decisions prior to initiating action (Perkins et al.). Athletic trainers must absorb a plethora of information while not missing valuable pieces that could have an impact on an athlete's treatment plan. Truth-seeking, inquisitiveness, and self-confidence are subscales on the CCTDI that are related to the seeking and evaluating component of this dispositional theory.

The final critical-thinking disposition, metacognition, describes one's inclination to monitor ones' own thought and process for thought. These individuals are sensitive to when one loses control of their thought process and can recognize when self-monitoring

is necessary in a given situation (Perkins et al., 1993). The ability to regulate mental processes and constantly evaluate thought processes are characteristics an individual demonstrating metacognition possesses (Perkins et al.). Athletic trainers can be faced with life-threatening situations and possessing the ability to recognize and self-regulate his or her thought process may have consequences or affect the outcome of a situation. Although not a direct component of the CCTDI, an individual who demonstrates a high level of maturity on the CCTDI may possess the ability to be cognizant of his or her thought process.

Summary

The field of medicine is ever changing and more complex. Healthcare providers must assume greater responsibilities, work more effectively with an increasingly more diverse team and population, and do all of this while being sensitive to fiscal pressures and controlling costs (Green, 1999). The ability to apply critical-thinking attitudes along with past knowledge and experience assists healthcare professionals and athletic trainers in applying clinical reasoning to make sound clinical judgments.

The field of athletic training is no different than any other healthcare field in that critical thinking, a component of clinical judgment, has been identified as an essential component to developing knowledge, becoming a successful professional practitioner, and an affective mentor and educator (Hanna, 2000). The third report of the Pew Health Professionals Commission (PHPC) stated that “All healthcare practitioners will be expected to have a strong foundation in the sciences, increased critical-thinking and problem-solving skills, and excellent communication skills” (PHPC, 1995, p.32). Teaching critical-thinking to students has been and will continue to be a fundamental

concern for educators (Badros, Seldomridge, & Walsh, 2005; McPeck, 1981; Velde, Wittman, & Vos, 2006; Wittman & Velde, 2002). The present study investigated critical-thinking disposition among graduate-level athletic-training students and its relationship to different demographical variables.

Research Questions

This study addressed the following four research questions:

1. What are the profiles of critical-thinking disposition among postprofessional graduate student athletic trainers and how do they compare with undergraduate athletic-training and certified athletic trainers for CCTDI and associated subscales?

2. To what extent are age and gender related to critical-thinking disposition among postprofessional graduate student athletic trainers as measured by the CCTDI and associated subscales?

3. To what extent are years of certification and first- or second-year graduate students' status related to critical-thinking disposition as measured by the CCTDI and associated subscales?

4. To what extent are undergraduate grade point average, number of times needed to pass the BOC examination, and certification or noncertification status related to critical-thinking disposition as measured by the CCTDI and associated subscales?

Definition of Terms

This section will provide a definition of terms that were used in this study. Although there are many different definitions cited in literature, the following definitions were used throughout this study.

Analyticity (A) - A is one of seven CCTDI subscales that focus on an individual's foresight to handle problematic or difficult situations, anticipating results or consequences of one's actions, and applying facts and sound logical thinking as effective means to resolve issues (Facione & Facione, 1990).

California Critical Thinking Disposition Inventory (CCTDI) – The CCTDI is an instrument constructed from an American Philosophical Association 2-year Delphi project that assesses an attitudinal aspect of critical thinking. The discipline neutral inventory is comprised of seven separate subscales scores and an overall score yielding a person's disposition toward or away from an ideal critical thinker. A total of 75 questions comprise the CCTDI, because of the proprietary nature of the instrument, the exact number of questions represented in each subscale is unknown. The CCTDI test manual states that between 8 and 12 questions represent each subscale (Facione & Facione, 1990).

Certified Athletic Trainer – Certified athletic trainers are healthcare providers who work with physicians to provide medical care to diverse populations. The profession of athletic training entails the prevention, diagnosis, rehabilitating of injuries, and providing immediate medical care for acute and chronic medical conditions. Certified athletic trainers must attend an accredited undergraduate athletic training program, complete

classroom and clinical competencies, and successfully pass a certification test administered by the Board of Certification (BOC). Once certified, athletic trainers must complete a certain number of continuing education hours every year to maintain certification (NATA, 2009).

Clinical Judgment – Clinical judgment is demonstrated when a healthcare practitioner uses his or her experience and knowledge to develop an opinion in the clinical setting that will guide decisions and actions regarding the care of a patient (Jackson et al., 2006).

Clinical Reasoning – Clinical reasoning refers to the process whereby a healthcare practitioner uses data and other objective information about a specific injury or disease to makes an evaluation about their significance and meaning (Jackson et al., 2006).

Cognitive maturity (CM) – CM is one of seven CCTDI subscales that focuses on one's ability to realize that some problems are ill-defined, some situations have more than one correct response, and judgments need to be made based on the best available information, standards, or evidence (Facione & Facione, 1990).

Critical-Thinking Disposition (CTD) – CTD is the proclivity toward using seven different attitudinal characteristics in one's personal and professional life. Truth-seeking, open-mindedness, analyticity, systematicity, self-confidence, inquisitiveness, and maturity are the seven characteristics as defined by the American Philosophical Association (Facione & Facione, 1990). For the current study, critical thinking disposition will be assessed using the CCTDI.

Critical-thinking self-confidence (SC) – SC is one of seven CCTDI subscales that focuses on the amount of confidence one places in one's own reasoning abilities. Possessing self-

confidence includes trusting in one's own judgment as well as knowing that others believe in one's judgment abilities (Facione & Facione, 1990).

Inquisitiveness (I) – I is one of seven CCTDI subscales that focus on assessing one's own intellectual curiosity and the drive to be educated in one's own discipline (Facione & Facione, 1990).

Open-mindedness (O) – O is one of seven CCTDI subscales that focus on one's own tolerance of divergent views from that of their own, the acuity to recognize one's bias, and the tolerance of the opinions of others (Facione & Facione, 1990).

Systematicity (S) – S is one of seven CCTDI subscales that focuses on an individual's drive for attentive, logical, and meticulous inquiry. This subscale does not suggest that inquiry needs to be in a linear or nonlinear format but the means to achieving the goal is performed in an orderly and conscious manner (Facione & Facione, 1990).

Truth-seeking (TS) – TS is one of seven CCTDI subscales that focuses on the disposition of enthusiasm to seek the truth, inquiring by asking questions, and the drive to find answers even if these answers do not support his or her interests or preconceived ideas (Facione & Facione, 1990).

Summary

The CCTDI is commonly used to assess one aspect of critical-thinking disposition in the healthcare professions. The current study examined the critical-thinking disposition of graduate-student athletic trainers and associated variables including age, undergraduate grade point average (GPA), gender, certified or noncertified athletic trainer at the time of the inventory, number of times needed to pass the BOC athletic training certification

exam, first- or second-year graduate students, and the number of years as a certified athletic trainer. The following chapters will present a review of literature of critical thinking disposition assessment in education and the healthcare fields followed by the methodology used in the current study (chapter 3). The final two chapters will present the results of the study (chapter 4) followed by the conclusion that includes the summary, limitations, discussion, and the practical implications of the study.

CHAPTER II

LITERATURE REVIEW

The purpose of this study was to measure critical-thinking dispositions of postprofessional graduate athletic-training students and to establish a critical-thinking disposition profile of graduate athletic-training students in accredited postprofessional graduate athletic-training programs using the California Critical Thinking Disposition Inventory (CCTDI). This profile is comprised of an overall CCTDI score and all seven subscales: truth-seeking, open-mindedness, analyticity, systematicity, critical-thinking self-confidence, inquisitiveness, and cognitive maturity. This chapter addresses the relevant background related to the CCTDI in nursing and other healthcare fields. Supporting research is presented related to a multitude of variables, such as age, gender, success rates on high stakes testing, grade point average (GPA), experience, and education and their relationship with critical-thinking disposition as measured by the California Critical-Thinking Disposition Inventory (CCDTI). A majority of the information presented is based upon the Facione and Facione (1997) aggregate data set that used the CCTDI on large sample of nurses to investigate whether or not relationships exist with many of the aforementioned variables. Finally, specific research is presented that has been conducted in the field of athletic training using the CCTDI.

This section begins with a brief history of an early critical-thinking theorist and critical thinking in education. A foundation is provided by explaining current definitions of critical thinking as well as steps the U.S. Government is taking to include critical thinking in all levels of education and healthcare curriculum. Finally, an explanation of the implementation of standardized tests to assess critical-thinking disposition in the

healthcare fields and its implication in undergraduate and graduate education is presented.

Critical-thinking Theorists

The idea of educating students to think critically is not a new concept. Over 2,000 years ago, Socrates stated "to find yourself, think for yourself" (World of Quotes, 2009). Socrates suggested that students and teachers alike should have the motivation and desire for deep questioning or inquiry for meaning. Dewey (1910) described critical thinking as reflective thought. He posited that any belief or knowledge put forth must receive careful and persistent consideration and scrutiny leading to its support that constitutes reflective thought arising from critical thinking.

In 1991, Pascarella and Terenzini offered a compilation of critical-thinking definitions from 1966 to 1991. These various definitions suggested that critical thinking

> typically involves the individual's ability to do some or all of the following: identify several issues and assumptions in an argument, recognize important relationships, make correct inferences from data, deduce conclusions from information or data provided, interpret whether conclusions are warranted on the basis of the data given, and evaluate evidence or authority (p. 118)

One can understand from this definition that there are many complex facets in the cognitive, affective, and psychological realms that comprise critical thinking. Several definitions proposed over the years to clarify what critical thinking entails are listed in Table 2. A common theme of reflection, purpose, direction, or skepticism is evident, but Paul (1993) suggested a meta-cognitive approach is necessary before critical thinking can even occur. Paul (1993) posited that to become a critical thinker, or even perform the act of critical thinking, one must possess the right attitude or what he called "intellectual

Table 2

Various Definitions of Critical Thinking and Their Derived Sources

Definitions	Source
"Reasonable and reflective thinking that is focused upon deciding what to believe or do"	Norris and Ennis (1989, p. 18)
"Our active, purposeful, and organized efforts to make sense of our world by carefully examining our thinking and the thinking of others, to clarify and improve our understanding"	Chaffee (1988, p. 29)
"Thinking that is purposeful, reasoned, and goal directed"	Halpren (1989, p. 5)
"The development and evaluation of arguments."	Facione (1984, p. 257)
"An individual's becoming aware of the demands of a given environmental circumstances and of evaluating numerous decision alternatives prior to taking an action that in many nut not all instances may lead to the solution to a problem."	Landis and Michael (1981, p. 1148)
"Critical-thinking involves certain skepticism, or suspicion of ascent, towards a given statement, established norm or mode of doing some things. This skepticism might ultimately give way to acceptance, but it does not take truth for granted. Instead, it considers alternate hypothesis and possibilities."	McPeck (1981, p. 6)
"Critical-thinking is a composite of attitudes, knowledge, and skills that include: 1. Attitudes of inquiry that involve an ability to recognize the existence of problems and an acceptance of the general need for evidence in support of what is asserted to be true; 2. Knowledge of the nature of valid abstractions, and generalizations in which the weight of accuracy of different kinds of evidence is logically determined; 3. Skills in employing and applying the above attitudes and knowledge."	Watson and Glaser (1991, p. 29)
"The ability to learn, to reason, to think creatively, to make decisions, and to solve problems"	U.S. Department of Labor (1992, p. xiv)
"Reasonable, reflective thinking that focuses on what to believe or do."	Ennis and Milman (1985, p. 9)
"The art of thinking about your thinking, while you're thinking, to make it better, more clear, accurate, and defensible."	Paul (1993, p. 15)
"Critical-thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action."	Scriven and Paul (1987)p1)

traits of the mind" (p. 22). The idea of meta-cognition is shared by Watson and Glaser (1991) who suggested that not only does attitude play a central role but also subject or domain specific knowledge. Additionally, Benner (1983) posited that cognitive, affective, and possibly meta-cognitive skills can be improved with both theoretical and practical knowledge.

Critical Thinking in Education

Many educators believe that the preparation of students, or future citizens, is highly dependent on schools to foster and develop critical-thinking skills (Costa, 1991; Nelson, 1994; Pithers & Soden, 2000). Costa suggested that, as society becomes more technologically advanced and complex, fostering and developing critical-thinking skills and dispositions will become a necessity. Additionally, Nelson posited that one learning objective and measurable outcome of a liberal and professional education should be critical thinking. In essence, teachers, instructors, and mentors should help students evaluate their own thoughts and progress toward more inquiry or problem-based learning (Pithers & Soden). In 1992, the U.S. Department of Labor noted the necessity of developing critical- thinking skills when it released the Secretary's Commission on Achieving Necessary Skills (SCANS) report. This report identified the necessity for schools to produce a citizen who can transfer his or her knowledge and skills to the workplace. This idea was further supported when the U.S. Department of Education released its own version of National Education Goals called "Goals 2000: Educate America Act" in 1994. This report identified eight areas of focus or national education goals. Goal #3 directly addressed student achievement and citizenship objectives:

> all students learn to use their minds well… the percentage of all students who demonstrate the ability to reason, solve problems, apply knowledge, and write and communicate effectively will increase substantially. (U.S. Department of Education, Goals 2000: Educate America Act, sect. 102)

The report continues by addressing adult literacy and life-long learning objectives in goal #6:

> By the year 2000, every adult American will be literate and will possess the knowledge and skills necessary to compete in a global economy… the proportion of college graduates who demonstrate an advanced ability to think critically, communicate effectively, and solve problems will increase substantially. (U.S. Department of Education, Goals 2000: Educate America Act, sect. 102)

Currently critical thinking is integrated in curriculum at all primary, secondary, and postsecondary educational levels (Duron, 2005; Paul, 1984). There is clear indication that critical thinking is not only necessary in the U.S. education and school system but also in society as a whole.

Although few healthcare educators have argued that critical thinking is not important, there is considerable debate regarding an operational definition and measurement (Chaffee, 1988; Facione, 1984; Halpren, 1989; Hanna, 2000). Ennis (1985) suggested that the terms higher-order thinking and critical thinking are defined so vaguely that it is useless for developing teaching, curriculum, and evaluation procedures. Videbeck (1997) investigated 55 baccalaureate nursing programs that elucidated 10 different definitions of critical thinking using a variety of assessment tools. Some assessment tools were standardized (Watson-Glaser Critical-thinking Appraisal, Cornell Critical-thinking Test, California Critical-thinking Skills Test, and the California Critical-thinking Disposition Inventory) and other assessments were developed for a specific investigation.

Prior to 1990 and the introduction of the California Critical Thinking Disposition Inventory (CCTDI), there were no tests available to assess dispositions of critical thinking at the college level. There were, however, three commonly used assessments of college-level critical-thinking skills prior to this time: The Watson-Glaser Critical Thinking Appraisal (1980), the Cornell Critical Thinking Test (1985), and the Ennis-Weir Critical Thinking Essay (1985). The CCTDI differed from the above critical-thinking tests because it focuses on personality attributes or attitudes identified from the Delphi report on critical thinking rather than seeking to measure critical-thinking skills. The Watson-Glaser Critical Thinking Appraisal was the instrument used in the field of nursing to assess critical-thinking skills and attitudes, but after a study published by Saucier (1995), it was suggested that a new instrument be used to assess critical thinking. It was hypothesized that an instrument that utilized a more robust theoretical definition of critical thinking and was conceived with greater conceptual clarity would elucidate more specific answers in the areas of attitude and skills related to critical thinking.

In 1990, the American Philosophical Association (APA) sponsored a Delphi project in an effort to develop an operational definition for critical thinking. The principal investigator, Peter Facione, recruited 46 peer-recognized experts in the fields of psychology, education, and philosophy and used a qualitative research method known as a Delphi method. Results of this 2-year study yielded a consensus statement on critical thinking, what characteristics an ideal critical thinker possesses, and cognitive skills and dispositions good critical thinkers possess. The definition would later become the foundation and operational definition for the California Critical Thinking Disposition Inventory (CCTDI).

The proposed definition of critical thinking is as follows:

> We understand critical-thinking (CT) to be purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of evidential, conceptual, methodological, criteriological, or contextual considerations upon which the judgment is based. CT is essential as a tool of inquiry. As such, CT is liberating force in education and a powerful resource in one's personal and civic life. While not synonymous with good thinking, CT is a pervasive and self-rectifying human phenomenon. The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair -minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. Thus, educating good critical thinkers means working toward this ideal. It combines developing CT skills with nurturing those dispositions which consistently yield useful insights and which are the basis of a rational and democratic society. (Facione, 1990, p. 3)

Ennis (1985) suggested that critical-thinking attitudes or dispositions were necessary to promote critical thinking, whereas Paul (1990) advanced this idea and identified seven attitudes referring to them as "traits of the mind" (p. 47). These seven traits are intellectual humility, intellectual courage, intellectual empathy, intellectual integrity, intellectual perseverance, faith in reason, and intellectual sense of justice. Green (1999) posited that critical thinkers will use one or more of these affective dispositions when problem-solving, analyzing, interpreting, and evaluating a situation further supporting the relationship between critical-thinking skills and dispositions.

The APA (Facione, 1990) Delphi study researchers agreed with Paul's (1990) theory, and as another outcome of the Delphi study, the group formulated a list of affective attributes or dispositions. The APA panel agreed that "awakening those attitudes in students" (p. 11) should be integrated into the instructional goals and educational assessment. Furthermore, a strong disposition toward critical thinking has

been suggested as integral in ensuring the use of critical-thinking skills (Facione, Sanchez, & Facione, 1994).

The development of the CCTDI assessment tool began with the Delphi project compiling 19 dispositional phrases of an ideal critical thinker. Ten to 15 pilot questions were written for each phrase for a total of 250 items. Each item was written so to elicit an equal number of positive and negative responses. Two-hundred-fifty of the items were assessed by college-level critical-thinking educators for ambiguity, readability, and consistency of interpretation. Out of the original 250 items, 150 items were retained and pilot tested at two universities in the United States and one university in Canada. From the 150 items remaining, item-total correlations were used to remove any ambiguous or unclear items. The final CCTDI contains 75 discipline-neutral questions.

The CCTDI is a 6-point Likert-type format ranging from 1 (*strongly agree*) to 6 (*strongly disagree*). Each of the 75 questions are separated further into one of seven different categories or subscales. The subscales of the CCTDI are truth-seeking, inquisitiveness, open-mindedness, critical-thinking self-confidence, analyticity, systematicity, and cognitive maturity. The maximum score in each subscale is 60, and a minimum score in each subscale is 10. A score of 30 or less is interpreted as opposition or weakness in the respective subscale, a score of between 31 and 40 indicates ambivalence toward the respective subscale, a score between 41 and 50 indicates a positive inclination toward critical thinking disposition, and a score greater than 50 indicates a high inclination or disposition toward the respective subscale (CCTDI Test Manual, 2010). An overall score is compiled by summing all of the seven subscales with the minimum score of 70 points and a maximum score of 420 points. A score greater than

280 indicates a positive disposition toward critical-thinking, whereas a score of 210 or less indicates a negative inclination toward overall critical-thinking disposition (CCTDI test Manual, 2010).

The following seven traits were identified as characterizing critical-thinking disposition: truth-seeking, open-mindedness, analyticity, systematicity, inquisitiveness, cognitive maturity, and critical-thinking self-confidence. Many of the disposition traits proposed by Paul overlap with the APA's, but the major difference between the two is that the APA's traits were created through a consensus panel and not by just one author. Additionally, the APA study pointed out that all of these attitudes are not subject-, domain-, or discipline-specific but are discipline neutral.

The first attitude is *truth-seeking*. It has been suggested that this disposition is the most difficult to cultivate (Facione, 1990). Truth-seeking individuals are those who are motivated to seek the best information in a given situation, condition, or problem. These people are not intimidated to further inquire about a given context and are ingenuous and objective about the pursuit and inquiry regardless if the findings agree or disagree with their own self-interests or preconceived opinions. This disposition suggests that when someone is presented with information contrary to his or her prior knowledge that he or she is willing to accept this difference and adjust his or her own beliefs to comply with these new facts. The key to a good truth-seeking student is that he or she remains receptive, open, and allow every conceivable consideration of supplementary information, facts, opinions, and perspectives even if this new information is counter to his or her current knowledge or beliefs. Conversely, someone who has a weak disposition toward truth seeking will develop personal biases toward a certain topic and have a

difficult time accepting or even pursing new knowledge contrary to his or her belief. In the field of nursing or athletic training, if a practitioner does not have the disposition of truth seeking, then he or she will have difficulty formulating a clinical impression from new information because of personal biases or the inability to accept that this new information is contrary to his or her current or prior knowledge (Facione et al., 1994).

Conversely, if one can recognize his or her bias and be tolerant of divergent views, then the person is considered to be an open-minded. *Open-mindedness* is the second disposition identified by the Delphi project. An open-minded individual recognizes and is tolerant of divergent views and is cognizant of how or if his or her own personal biases can affect his or her view of a problem or situation (Facione, 1990). In athletic training, this disposition directly affects someone's ability to work in a team atmosphere or share his or her findings with other members of the healthcare team. Additionally, an open-minded clinician recognizes divergent views from other healthcare team members such as physical therapists, massage therapists, and chiropractors.

The third disposition is *analyticity*. Analyticity is thought to be a core disposition for the inquiring mind (Facione et al., 1994). The analytical mind uses reasoning in conjunction with presented evidence to dissect problems, anticipate conceptual or practical issues, and possesses the vigilance to intercede when necessary, which are all hallmarks of a person with a strong disposition toward analyticity. Benner (1984) described this disposition as one that increases as someone progresses from a novice to an expert in his or her respected profession. Furthermore, Benner posited that perceptual awareness of vague or subtle changes in a patient's condition can assist nurses, or athletic trainers, in the appropriate course of action in a timely manner. Sometimes this awareness

or anticipation is through physical findings or through what Benner (1984) called a “gut feeling” (p. xvii).

S*ystematicity* is the fourth disposition. Systematicity identifies how disposed someone is to an organized, orderly, and focused process necessary for inquiry. Facione et al. (1994) were quick to point out that this process can be either linear or nonlinear depending on the amount of experience one possesses. Benner (1983) argued that a novice practitioner would demonstrate a very systematic process that would be very linear and recognizable to those around, whereas an expert practitioner disposes of systematic approach and through past experience would more easily identify the most pressing issues disposing of irrelevant information in a more timely manner than a novice would have the ability to do.

The Delphi project identified *inquisitiveness* as the fifth disposition. Paul (1990) identified this disposition as an intellectual perseverance or one’s curiosity to further inquire about a given topic when the information to solve a problem is not available. Other characteristics used to describe an inquisitive person are curious, probing, desire to acquire further knowledge, and possessing an inclination to pose in-depth questioning (Facione et al., 1994). These students are life-long learners striving to further his or her knowledge in a given discipline. The field of medicine is ever changing with new technologies and advances happening on a daily basis. Although athletic trainers are required to obtain continuing education credits to maintain their certification status, an inquisitive athletic trainer will use opportunities to seek a deeper level of knowledge to improve his or her professional aptitude or skills. Inquisitive-minded clinicians are not satisfied with superficial or cursory responses to their questions but seek to obtain

profound understanding and depth in the subject matter or situation (Radke, 2008). Conversely, someone who does not possess the disposition of inquisitiveness would suggest indifference toward the opportunity to gain knowledge.

C*ognitive maturity* identifies how judicious some are in their decision making and is the sixth disposition. Many situations faced by athletic trainers are ill-structured or the answers are not apparent; a cognitively mature person will identify a certain approach or more than one plausible option and come to a decision based on rules, maxims, contexts, and the evidence presented (Facione, 1990). The cognitively mature student is sagacious in making, interrupting, or revising his or her opinions while demonstrating sensitivity to reach closure in a timely manner (Benner, 1983). Not many people would argue that healthcare providers need to demonstrate the ability to make decisions in a timely manner. Sometimes athletic trainers, like nurses or other healthcare providers, must utilize life-saving techniques such as cardiopulmonary resuscitation or operate an automated external defibrillator. Identifying life-threatening conditions and making judicious decisions is something a cognitively mature person will demonstrate.

The final disposition is critical-thinking *self-confidence*. Self-confidence is identified as the assurance someone possesses in his or her own reasoning processes or, in other words, how much faith someone has in his or her own decision-making abilities. This disposition tends to increase as one not only matures but also gains additional situational and clinical experiences (Facione et al., 1994). Additionally, Benner (1984) suggested that, in the field of nursing, past experiences and clinical successes and failures can further support increases in self-confidence. In the field of athletic training, students gain self-confidence in clinical rotations through the direct supervision and guidance of a

mentor or clinical instructor. The self-confidence exuded by the athletic trainer can make an athlete or patient more confident in his or her ability and treatment plan and increase treatment compliance.

Facione, Facione, and Giancarlo (2000) reiterated the fact that the above dispositions did not represent defined skills but rather created a consistent internal motivation necessary to apply these skills in solving problems and sound decision-making skills. Furthermore, it is not necessary for someone to demonstrate strength in all areas of disposition scale to be a critical thinker, conversely, if someone is thinking critically, it does not mean that he or she is excelling or even using all areas of critical-thinking disposition.

Although the consensus definition identifies two different aspects of critical thinking, skills and disposition, it has been posited by numerous researchers that critical-thinking skills and critical-thinking dispositions are different attributes and should be treated as such (Esterle, 1993; Facione, Facione, & Giancarlo, 2000). Facione and Facione (1997), McCarthy, Shuster, Zehr, and McDougal (1999), Profetto-McGrath (2003), Colucciello (1997), and Shin, Jung, Shin, and Kim (2006) all investigated the relationship between critical-thinking skills and critical-thinking disposition using the California Critical Thinking Skills Test (CCTST) and the CCTDI and found a small but positive correlation between these two elements of critical thinking. If in fact there is a correlation between critical-thinking skills and critical-thinking dispositions, then each subscale on the CCTDI and the CCTST should correlate one-to-one with each other.

Facione and Facione (1997) performed the largest study investigating whether or not a relationship exists between critical-thinking skills and critical-thinking disposition using two samples of 1,325 and 1,428 nursing students. Out of 35 possible correlations assessed (seven subscales for the CCTDI and five subscales for the CCTST); the data revealed a positive correlation between 24 of the 35 subscales measured. Three subscales in particular, systematicity, self-confidence, and analyticity subscales yielded statistically significant correlations between at least three subscales on the CCTST. Facione and Facione posited that if a relationship existed between critical-thinking skills and critical-thinking disposition, then there would have only been either a one-to-one relationship or a relationship between two or three clusters of subscales of the two instruments. Tishman, Jay, and Perkins (1993) acknowledged the importance of critical-thinking skills but suggested that possessing the correct disposition of thinking can have a greater influence on the learning outcomes.

Critical-Thinking Disposition Assessment

From 1994 to 1997, Noreen Facione and her colleagues conducted a longitudinal and cross-sectional study to investigate critical-thinking attitudes using the CCTDI. Fifty nursing programs participated from across the United States. The following variables were investigated: academic and demographic variables including registered nurse status, pass-fail rate on the national nursing licensing examination, grade point average, gender, and age. At the time of the study, there was a dearth of longitudinal and cross-sectional data using this newly developed instrument measuring critical-thinking attitudes. The purpose of the study was to develop national normative data for nursing programs using the CCTDI and to explore the extent in which critical-thinking attitudes affect the

development of clinical expertise and clinical judgment in nursing education. The next sections present the results of this study and subsequent research using the CCTDI in nursing as well as other healthcare fields broken down by variables investigated.

The following paragraphs explain the results of the original study lead by Facione and Facione (1997) using the CCTDI on nursing students as well as associated studies comparing results with the original study using the CCTDI. Facione and Facione used a cross-sectional and longitudinal study design to investigate the following variables: Class level, pretest and posttest changes in critical-thinking disposition, age, gender, registered nursing licensure status, grade point average, and pass or fail rate on the registered nurse national licensing examination.

Freshman or First-year Nursing Students

The first variable investigated by Facione and Facione (1997) was class level (Table 3). The prenursing students demonstrated on average the lowest overall CCTDI score of all class levels but were overall positive (≥ 280). All subscale means were greater than 40 except truth-seeking; whereas, inquisitiveness demonstrated the strongest overall subscale means with over 25% of the freshman achieved a score greater than 50 on this subscale suggesting a positive inclination toward critical-thinking disposition. The second lowest mean was the self-confidence subscale.

A closer inspection of the data revealed that less than 3% of the 216 students had scores less than or equal to 30 on openmindedness, analyticity, systematicity, and maturity, whereas 15% of the prenursing sample had scores less than or equal to 30 on truth-seeking suggesting a negative inclination toward critical-thinking disposition.

Additionally, 60% of the freshman had scores between 31 and 39 on the truth-seeking subscale suggesting ambivalence toward allowing others to hold opinions different from their own.

Table 3

Means and Standard Deviations for Pre-Nursing Freshman, Sophomores, Juniors, Seniors, and Master's Level Nursing Students on the Overall CCTDI and Associated Subscales

Scales	Statistics	Freshman	Sophomores	Juniors	Seniors	Master's
TS	*M*	36.38	38.72	38.22	38.70	40.50
	SD	5.34	6.21	6.03	4.78	5.93
	n	255	580	817	1041	134
OM	*M*	43.93	44.70	44.73	45.11	45.60
	SD	4.96	5.28	4.99	4.67	5.47
	n	261	578	817	1040	134
A	*M*	43.18	44.08	43.52	44.03	44.70
	SD	5.22	5.33	5.56	4.42	4.97
	n	250	576	817	1039	134
S	*M*	42.46	43.43	43.66	43.78	43.40
	SD	6.01	6.77	5.58	5.20	6.81
	n	260	579	817	1038	134
SC	*M*	41.31	44.05	43.34	44.59	46.00
	SD	6.30	6.53	5.92	5.47	5.96
	n	262	577	817	1040	134
I	*M*	46.61	48.67	48.39	48.80	50.60
	SD	6.30	6.02	5.61	4.89	5.12
	n	262	579	817	1040	134
M	*M*	44.95	46.44	46.05	46.09	46.10
	SD	5.81	6.24	5.73	4.83	5.88
	n	250	579	817	1039	134
Total	*M*	298.60	310.40	308.00	311.40	317.00
	SD	25.71	28.78	27.80	23.71	27.50
	n	216	570	817	1035	134

Note: TS=Truth-seeking; OM=Openmindedness; A=Analyticity; S=Systematicity; SC=Self-confidence; I=Inquisitiveness; M=Maturity

One common pattern that emerged from these data was the fact that if a student was weak (scored low or ≤ 40) on one scale then he or she tended to be weak overall (≤ 280). Conversely, students who demonstrated strength in a particular subscale (≥ 40) had a tendency to be strong across all subscales as represented by their overall score (≥ 280).

This trend was consistent in studies investigating a cross-section sample of first-year or freshman healthcare students (Bartlett & Cox, 2002; Giancarlo & Facione, 2001; Lederer, 2007; Profetto-McGrath, 2003; Thompson & Rebeschi, 1999).

In previous studies using the CCTDI with first-year students, Facione, Sanchez, and Facione (1992) administered the CCTDI to 588 freshmen at a private urban university and found very similar results to the sample using only prenursing students. Their sample had the lowest mean on truth-seeking (*M*=35.36, *SD*=5.40), their highest mean on inquisitiveness (*M*=47.60, *SD*=6.10), and an overall mean (*M*=298.33, *SD*=27.36) very similar to the nursing cohort. Although Ip et al. (1999) found that third-year Hong Kong Chinese nursing students had scores lower than first- and second-year nursing students, they posited that the third-year curriculum, small sample size (*n*=21), and other possible confounding factors such as personal or social status, may have inhibited or even reversed gains in critical thinking from the first to third year.

Sophomores or Second-year Students

The sophomores or second-year nursing students demonstrated very similar results to the first-year nursing students with means above 40 in all subscales except truth-seeking and inquisitiveness having the highest mean as represented in Table 3. Facione and Facione (1997) suggested that a jump in the overall mean on the CCTDI could be due to the departure of freshmen who may have had weak scores during their freshman year. There was a slight drop in percentage of student's scores less than 30 on the truth-seeking subscale (10% rather than 15% as freshman) and only 46% of the sophomores or second-year students had scores in the ambivalent range (31 to 39) on the

truth-seeking subscale. Although not statistically significant, Lederer (2007) revealed a decrease in truth-seeking from first year to second year in his sample even though the overall mean increased to 300.50 from 299.09, but his sample size was only 20 participants, which could account for the fall from first- to second-year student means on truth-seeking. These results were contrary to the findings of Profetto-McGrath (2003), Ip et al. (2000), and Bartlett and Cox (2000) that revealed an increase in the mean from first to second year on all subscales and overall CCTDI scores.

Juniors or Third-year Students

The mean for junior nursing students revealed very similar results as those of the sophomore class (Table 3). Their overall CCTDI and all subscales means were greater than 40 except truth-seeking, which is like the sophomore CCTDI mean profile. Similar to the sophomore class, 9% of the junior nursing sample revealed negative scores on the truth-seeking (≤ 30) subscale; however, the number of students in the ambivalent range increased to 56% on the truth-seeking. The highest mean was recorded on the inquisitiveness subscale for the junior nursing students. These results are very similar to studies conducted by Colucciello (1997), Lederer (2007), and Profetto-McGrath (2003) but not similar to a study conducted by Ip et al. (2000). In that study, Ip and his colleagues found a statistically significant difference in means reported for third-year students compared with first- and second-year students, but it should be noted that Ip et al.'s study had a low number of participants during the third year (n=21) compared with the first (n=51) and second year (n=50). All of the aforementioned studies consistently revealed truth-seeking to be the lowest reported mean, whereas inquisitiveness was the highest reported mean.

Senior or Fourth-year Students

The senior nursing students investigated revealed an increase in overall mean and all subscale means (Table 3) along with only 3% of the students having scores that were negative on the truth-seeking subscale; however, the number of seniors with scores in the ambivalent range for truth-seeking increased to 71% from the 64% demonstrated by their junior counterparts. Similar results were obtained by Colucciello (1997) and Profetto-McGrath (2003). In both of these studies, truth-seeking was the only subscale that remained in the ambivalent range through all 4 years of college-level education. Colucciello (1997) suggested that the reason for the low truth-seeking mean lies in the didactic-oriented classes where lectures are presented with the intent of students retaining vast amounts of knowledge with very little reciprocal exchange of knowledge between instructor and student. The result of this limited exchange of information or follow-up questions fosters passive learning and can inhibit the pursuit of inquiry. Students are not afforded the opportunity to ask probing questions, developing reasoning process through inquiry-based learning, and reduces the likelihood students will explore opposing opinions, ideas, or points of view from their own.

Graduate-level Nursing Students

Graduate-level nurses had the highest scores on the overall scale and on every subscale compared with all years of undergraduate nursing students (Table 3). Additionally, this was the first group on average to achieve a mean of greater than 40 on the truth-seeking subscale and greater than 50 on the inquisitiveness subscale placing these students in the strongly positive range for this disposition. Facione and Facione

(1997) cautioned the results suggesting that a self-selection effect may be the reason for these results. Furthermore, Facione and Facione cited that stronger students tend to pursue advanced degrees leading to students achieving such a high level on the overall CCTDI and associated subscales. CCTDI overall means from two studies with doctoral-level pharmacology students produced lower means than for the aggregate data set. Students in Phillips, Chesnut, and Respond's (2004) study had a mean of 299.5 (*SD*=33.2), and students in Miller's (2003) study had a mean of 306.6 (*SD*=23.1), which both are lower than the graduate-level nurses, and just as in the aggregate data set, both studies had truth-seeking having the lowest subscale mean 36.5 (*SD*=5.9) and 37.28 (*SD*=6.05) compared with other subscale means. Lederer (2007) obtained similar results on graduate-level occupational therapy students (Table 4). This study found that graduate students had a mean similar to the nursing aggregate data and the lowest subscale mean was truth-seeking.

Table 4

Means, Standard Deviations, t test, and eta squared values for 48 Occupational Therapy Undergraduate Students (UG) Compared with 31 Occupational Graduate Students (Grad) on the Overall CCTDI and Associated Subscales

Sample	Statistics	TS	OM	A	S	SC	I	M	Total
UG	*M*	37.17	43.92	43.04	40.98	42.29	44.89	44.10	295.08
	SD	5.44	5.42	4.49	6.48	5.98	6.44	5.65	21.40
	t(78)	-1.02	-2.98*	-0.82	-0.93	-1.42	-1.80	-2.99*	-2.82*
	η^2	.01	.09	.01	.01	.02	.02	.10	.09
Grad.	*M*	38.48	45.97	43.84	42.48	44.29	47.81	47.81	310.29
	SD	5.90	5.43	3.72	7.85	6.33	5.45	5.35	23.30

Note: * Statistically significant; TS=Truth-seeking; OM=Openmindedness; A=Analyticity; S=Systematicity; SC=Self-confidence; I=Inquisitiveness; M=Maturity

Additionally, Lederer compared occupational health graduate student's results on the CCTDI and associated subscales with those of undergraduate occupational health students and found statistically significant differences in overall CCTDI. All results

demonstrated a medium level of practical importance. These results suggested that on average graduate occupational health student's demonstrated greater overall critical-thinking disposition, openmindedness, and cognitive maturity compared with their undergraduate counterparts.

There has been very little research investigating critical-thinking disposition for graduate-level students, but there is an assumption that graduate-level education promotes changes in critical-thinking disposition (Seldomridge & Walsh, 2006). The current study compared whether there was a difference in critical-thinking disposition between undergraduate athletic-training students, certified athletic trainers, and graduate athletic-training students and from first- to second-year graduate athletic-training students. The next section presents research related to CCTDI assessment in athletic training.

CCTDI Assessment in Athletic Training

There is only one published study in the field of athletic training using the CCTDI to assess critical-thinking disposition. Leaver-Dunn, Harrelson, Martin, and Wyatt (2002) assessed 91 undergraduate students from three different universities (two public and one private) using the CCTDI to investigate if a relationship exists between a number of variables (Table 5).

These variables include years in an undergraduate athletic training program, GPA, completed semester hours, gender (46 were male and 45 were female), ethnicity (73 were European American, 13 were African-American, and 5 identified as Other), and completed clinical hours. The overall total mean for the CCTDI was 293.15 (*SD*=26.05),

which is lower than the mean for the Facione and Facione (1997) nursing aggregate data (*M*=310.4; *SD*=28.78).

Table 5

Means and Standard Deviations for Demographical Information on Athletic-Training Undergraduate Students from Leaver-Dunn et al. (2002)

Demographics	*M*	*SD*
Year in ATEP	1.93	0.94
Cumulative GPA	3.22	0.35
Completed Semester Hours	91.08	26.16
Clinical-Experience Hours	771.18	450.96

Note: *n*=91; ATEP=Athletic Training Education Program; *M* age=22.33 (*SD*=1.94)

Additionally, the lowest subscale mean was on the truth-seeking and the highest mean was on the inquisitiveness subscale, which is consistent with but lower than the nursing aggregate data (Table 6). The additional variables investigated revealed no statistical significance. These results are consistent with previous findings investigating physical therapy students and may be as much dependent on the program curriculum as it is for students (Bartlett & Cox, 2000).

Table 6

Means and Standard Deviations for Various Articles in Athletic Training Investigating the CCTDI and Associated Subscales

Study and Sample	Statistics	TS	OM	A	S	SC	I	M	Total
Leaver-Dunn et al. (*n*=91)	*M*	35.10	40.73	43.72	41.13	42.52	45.59	42.23	293.15
	SD	5.66	6.09	4.42	6.44	6.52	5.66	6.51	26.05
Racchini (*n*=258)	*M*	39.20	41.20	44.10	43.70	44.60	47.20	43.10	303.10
	SD	4.28	4.79	5.15	5.77	5.63	5.58	5.40	27.72

Note: TS=truth-seeking; OM=Openmindedness; A=Analyticity; S=Systematicity; SC=Self-confidence; I=Inquisitiveness; M=Maturity

An unpublished doctoral dissertation by Racchini (2007) is the only other study in athletic training where the CCTDI was used to assess critical-thinking disposition. This researcher investigated whether or not a relationship existed between CCTDI overall and

subscales and gender, age, ethnicity, job setting, years of experience, salary, final undergraduate GPA, highest degree obtained, route to certification (internship or curriculum), and board of certification examination results. The total overall mean on the CCTDI was higher than that obtained in the study by Leaver-Dunn et al. (2002) as shown in Table 5. Although mean age was not obtained in Racchini's study, the age would be higher because the sample used was certified athletic trainers and not undergraduate students used in the Leaver-Dunn et al. study. There were some similarities between the two studies, truth-seeking was still the lowest mean and inquisitiveness was still the highest mean on the CCTDI subscales. All other subscale scores fell in the positive ranges that are consistent with other athletic training students (Leaver-Dunn et al., 2002), nursing students (Facione & Facione, 1997), and physical therapy students (Bartlett & Cox, 2000).

The results of these two studies suggest that practicing athletic trainers and athletic-training students, on average, have an affinity to pursue knowledge (inquisitiveness), perceive confidence in his or her ability to make sound judgments (self-confidence), possess the foresight to anticipate future problems before they may occur (analyticity), perceive strongly that organization is a necessary habit (systematicity), and are inclined to make prudent decisions even in ill-defined situations (maturity). Although the openmindedness mean was in the positive range, it was borderline ambivalent, which suggests that athletic trainers may have difficulty accepting new ideas that are divergent from their own. Finally, truth-seeking had the lowest subscale mean suggesting that athletic trainers may not be willing to seek the best knowledge available or ask challenging questions about their actions or abilities.

The independent variables investigated in the Racchini (2007) study failed to elicit any statistical significance except for the subscales of analyticity ($F_{1,256}$=2.72, $\acute{\eta}^2$ =.01), systematicity ($F_{1,256}$=3.31, $\acute{\eta}^2$ =.01), maturity ($F_{1,256}$=2.61, $\acute{\eta}^2$ =.01), and overall CCTDI score ($F_{1,256}$=3.20, $\acute{\eta}^2$ =.01) for final undergraduate GPA. Additionally all of the subscales that achieved statistical significance had very small levels of practical importance. These results were similar to the results obtained by Giancarlo and Facione (2001) that demonstrated statistically significant relationships between openmindedness, analyticity, systematicity, maturity, and overall CCTDI scores and GPA. They surmised that these results occurred because instructors generally reward students who possess higher critical-thinking abilities with a higher grade in the class.

Although none of the other variables were statistically significant, there were some patterns that emerged from the data. Athletic trainers with greater than 20 years of experience, on average, scored the highest on the inquisitiveness subscale. These results were similar to those obtained by Hicks, Merritt, and Elstein (2003) and were explained by the high number of students with degrees (> 90%) that were very close in comparison to Racchini's (2007) demographics (100% with at least a bachelor's degree).

The sample used in Racchini's (2007) study revealed higher overall CCTDI and subscale means than the sample used in Leaver-Dunn et al.'s (2002) study. The sample used in Racchini's study was older, all were certified at the time of the CCTDI administration, and all had more experience than those sampled in the Leaver-Dunn et al.'s study. Although, a majority of the participants in Racchini's study possessed a master's degree (69.8%), no comparison was made between those who had a master's degree and undergraduate students. The current study investigated whether a difference

does exists between graduate and undergraduate students and certified athletic trainers. The next section contains research related to pretest-posttest changes in critical-thinking disposition.

Pretest-Posttest Change in Critical-thinking Dispositions

The original aggregate data set by Facione and Facione (1997) included 171 undergraduate nursing students. This longitudinal study revealed statistically significant increases in three subscales and in overall score from entry to exit of the undergraduate nursing students. There were statistically significant gains in truth-seeking from a mean of 38.9 to 39.9 (t [170]=2.00, $\acute{\eta}^2$=.02); analyticity from a mean of 44.2 to 45.2 (t[170]=2.24, $\acute{\eta}^2$=.03); and self-confidence from 44.1 to 45.8 (t[170]=3.85, $\acute{\eta}^2$=.09). Both the truth-seeking and analyticity subscale achieved a small magnitude of practical importance but self-confidence achieved a medium to large level of practical importance. Additionally, students were grouped as either negative (10 to 30 on a subscale), ambivalent (31 to 39), or positive (40 to 60) on the given CCTDI subscale to investigate any group shift that may have occurred. The focus of the results presented in the aggregate data sets were for the truth-seeking subscale because this subscale revealed the lowest means when investigating class level. Out of the 171 undergraduate students, 70 entered classified as high on the truth-seeking subscale, 90 entered as ambivalent, and 11 entered as low. Of the 70 who entered high, 45 remained high, 25 ended in the ambivalent category, and none ended in the negative range. Of the 90 who entered ambivalent, 34 improved to the high range, 50 remained ambivalent, and only 6 ended in the low range. Finally, of the 11 who started low, one advanced to the high range, 9 became ambivalent and, only one remained low. These data suggest that as a student

progresses through his or her undergraduate studies that his or her CCTDI and certain subscale means may increase due to a number of instructional, maturity, or experience factors.

In a similar longitudinal study by Giancarlo and Facione (2001), the investigators examined pretest and posttest scores for 147 undergraduate students. All subscales increased from year one to year four but only the truth-seeking (t[146]=5.60, $\acute{\eta}^2$=.21), self-confidence (t[146]=4.13, $\acute{\eta}^2$=.11), and overall scores (t[146]=3.12, $\acute{\eta}^2$=.07) were statistically significant and revealed medium to large levels of practical importance from pretest to posttest. Additionally, in all subscales, more students increased from ambivalent to positive than decreased from positive to ambivalent. The most notable changes occurred in the truth-seeking subscale with 27% of the students increasing from ambivalent to positive and the systematicity subscale where 21% of the students went from ambivalent to positive. Giancarlo and Facione suggested that, at least at this particular undergraduate college, critical-thinking disposition either stays the same or increases over 4 years of undergraduate education.

Similar results were noted in a study by McCarthy, Schuster, Zehr, and McDougal (1999) that investigated change in CCTDI and subscales from sophomore to senior year for 240 baccalaureate nursing students. Although all CCTDI subscale means increased from sophomore to senior year, an independent-samples t test revealed that senior scores were statistically significantly higher on average on the overall CCTDI (t[239]=2.5, $\acute{\eta}^2$=.03) and on four subscales of truth-seeking (t[239]=2.2, $\acute{\eta}^2$=.02), self-confidence (t[239]=2.9, $\acute{\eta}^2$=.03), analyticity (t[239]=2.2, $\acute{\eta}^2$=.02), and inquisitiveness (t[239]=2.2, $\acute{\eta}^2$=.02). All results revealed a small level of practical importance.

Leppa (1997) conducted a longitudinal study in which all seven subscales increased from pretest to posttest with inquisitiveness being the only subscale where there was no statistical significance. Additionally, results from a longitudinal study of junior and senior nursing students by Thompson and Rebeschi (1999) yielded statistical significance difference in overall means from entry to exit (entry mean 323.9 vs. exit mean of 332.5), and in subscale means for analyticity (entry mean of 44.97 vs. exit mean of 46.63) and truth-seeking (entry mean of 40.87 vs. exit mean of 43.19). It should be noted in Leppa's and Thompson and Rebeschi's studies, all subscales were greater than 40 on the posttest and both studies had participants who initially had higher means on the entry CCTDI than the aggregate data set by Facione and Facione (1997). These results suggest that improvements can be made as a student progresses through his or her academic career. It should be noted, in Leppa's study, the mean age was considerably higher than Facione and Facione's aggregate data set (M=37.0 vs. 26.6), and all students were registered nurses but returning for a bachelors degree to further their education suggesting that age or experience may have been factors contributing to these results.

The results of Leppa's (1997) study contradicted, to an extent, the results of a similar longitudinal analysis performed by Stewart and Dempsey (2005). In their study of 55 undergraduate nursing students, Stewart and Dempsey's data revealed an increase in all subscales from sophomore to senior year, but the increase was not statistically significant as found in the study by Giancarlo and Facione (2001). Stewart and Dempsey suggested differences occurred between the two studies because of the setting, curriculum, and student demographical differences. Another factor may be the duration between pretest and posttest as seen in the results from a 2008 study of nursing students

participating in an online course. Carter (2008) revealed no changes in means from pretest to posttest on the CCTDI, but the pretest and posttest were administered at the beginning and end of the semester course. Studies with a longer duration between pretest and posttest yielded more statistically significant changes in CCTDI scores.

Bartlett and Cox (2002) administered the CCTDI to physical-therapy students at the beginning, end (7 months after initial testing), and after their clinical rotation (5 months later) over a one-year period. Their results revealed a statistically significant improvement from the first 7 months and after their clinical rotation and an effect size of 1.01, which is not only considered large but demonstrates an increase of one standard deviation from one testing period to another. Interestingly, truth-seeking was the only subscale to demonstrate statistically significant improvement over the three testing periods, whereas openmindedness, self-confidence, inquisitiveness, and maturity were all statistically significant from test period one to test period two. Bartlett and Cox were very cautious about the results because of the low number of participants for all three tests (n=40), a response rate of only 23%, and high attrition from first to third test (120 to 28). The only published study in athletic training by Leaver-Dunn et al. (2002) on undergraduate students revealed no statistical significance in the number of clinical hours and performance on the overall CCTDI and associated subscales but the mean number of hours was 771.18 (SD=450.96) and number of years of experience was 1.93 (SD=.94). A possible difference on the CCTDI and associated subscales may be seen by older and more experienced graduate athletic-training students.

Almost all of the studies investigating CCTDI change from pretest to posttest revealed statistically significant changes in overall means but very little practical

importance (Bartlett & Cox, 2002; Facione & Facione, 1997; Giancarlo & Facione, 2001; Leppa, 1997; McCarthy et al., 1999; Thompson & Rebeschi, 1999). Additionally, subscales truth-seeking and self-confidence consistently increased from pretest to posttest. Currently there are no studies in the field of athletic training investigating graduate-level students and whether or not there is a difference between critical-thinking dispositions during graduate-level education compared with undergraduate education or associated variables. The next section contains a review of research related to age and critical-thinking disposition.

Age and Critical-thinking Disposition

Age has been another variable investigated related to critical-thinking disposition. The theory postulated that, as someone gets older and presumably gains more experience in life, he or she will have higher scores than a younger person on the CCDTI (Facione & Facione, 1997). According to the aggregate data study by Facione and Facione, age is correlated positively on the overall CCTDI and all subscales. Even though overall CCTDI and associated subscales were positively correlated with age, their sample of 829 nursing students between the ages 18 and 58 (M=26.6; SD=8.1) revealed only one subscale achieving a statistically significant relationship. Truth-seeking had the highest correlation (r=.23), yet this value only accounted for 5% of the variation in the relationship with age. The results of the study by Facione and Facione suggest that aging, or normal development seen in the college years, may not be the only factor affecting the changing truth-seeking subscale values from the beginning to the end of the nursing program. When analyzing similar studies that investigated age, the results are a little different from the aggregate data set. The students used in the aggregate data set were

undergraduates with a mean age of 26.6 that could explain why many of the subscales did not achieve a level of statistical significance, but other studies whose sample was considerably older revealed different scores on overall and subscales of the CCTDI.

Hicks, Merritt, and Elstein (2003) and Leppa (1997) both had participants in their 30s for their data sets. In Leppa's (1997), study the mean age of the participants was 37 years old, and all subscale means were above 40 indicating a positive disposition (Table 7). In the Hicks et al.'s study, the mean age was 33.8, but the subscale means for analyticity, openmindedness, and truth-seeking were all below 40 (Table 8).

Table 7

Means and Standard Deviations for 77 Registered Nurses Completing Their Baccalaureate Degree on the Overall CCTDI and Associated Subscales from Leppa (1997)

Scale	*M*
Overall CCTDI	325.0
Truth-seeking	44.0
Openmindedness	48.0
Analyticity	45.0
Systematicity	44.0
Self-confidence	46.0
Inquisitiveness	50.0
Cognitive Maturity	49.0

Table 8

Means and Standard Deviations for 54 Registered Nurses Working in Adult Critical Care on the Overall CCTDI and Associated Subscales from Hicks, Merritt, and Elstein (2003)

Scale	*M*	*SD*
Overall CCTDI	295.40	19.90
Truth-seeking	32.90	3.80
Openmindedness	35.50	4.90
Analyticity	39.00	4.00
Systematicity	41.30	4.80
Self-confidence	51.50	5.10
Inquisitiveness	51.20	4.60
Cognitive Maturity	44.90	4.90

Additionally, on two of the subscales in the Hick et al. study, the subscales of maturity and inquisitiveness had a mean above 50, and the participants were critical-care nurses with an average of almost 10 years of experience. It was suggested by Hicks et al. (2003) and Leppa (1997) that these results of such high subscale averages on cognitive maturity and inquisitiveness were due in part to the specialty field and the fact that over 90% of the participants had advanced degrees. Higher CCTDI scores for older students is further supported in a study by Yeh and Chen (2003) who compared Chinese nursing students under 30 with those over 30 and found statistically significant higher overall CCTDI scores for the older students ($F[1,219]=5.22$, $\acute{\eta}^2=.12$). Their participants were all undergraduate students that could suggest that there is an increase in some cognitive function as people age. Chen's study yielded a moderate to large measure of practical importance.

Hicks et al. (2003), Leppa (1997), and Yeh and Chen (2003) have posited that older students develop better habits of the mind or dispositions over time as they enter or return to a program as demonstrated by higher pretest scores compared with the aggregate data set of Facione and Facione (1997). Furthermore, researchers have posited that studies yielding statistical significant changes in disposition may be due to the type of instruction provided at their respective institutions (Giancarlo & Facione, 2001; Leppa, 1997; McCarthy et al., 1999; Profetto-McGrath, 2003; Stewert & Dempsey, 2005; Thompson & Rebeschi, 1999).

Studies investigating the relationship between age and critical-thinking disposition have yielded stronger results if the participants are older as compared with younger (Facione & Facione, 1997; Hicks et al., 2003; Leppa, 1997; Yeh & Chen, 2003).

These results would suggest that age appears to be a factor in critical-thinking disposition, and as one ages, the results on the CCTDI increase as a result of normal cognitive development (Yeh & Chen, 2003). Only one study in the field of athletic training investigated age as a variable. Although no statistical significance was revealed between age and overall CCTDI or associated subscales, Racchini (2007) found that athletic trainers over the age of 50 had the highest overall CCTDI and truth-seeking, analyticity, systematicity, inquisitiveness, and maturity subscale means (Table 9). The next section presents the research related to gender and critical-thinking disposition.

Table 9

Means and Standard Deviations for Age Differences on the Overall CCTDI and Associated Subscales from Racchini (2007)

	>30 (*n*=70)		30-39 (*n*=109)		40-49 (*n*=50)		50+(*n*=19)	
Scale	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Total	302.90	23.13	307.00	27.30	298.24	31.63	308.80	25.40
TS	38.60	4.02	39.70	4.31	39.00	4.28	40.70	4.01
OM	41.40	4.55	41.70	5.06	40.40	4.56	41.00	4.27
A	44.50	4.38	44.60	5.57	42.90	5.13	45.10	4.61
S	43.40	5.50	44.10	5.81	43.30	6.04	44.70	5.10
SC	44.80	4.98	45.40	5.84	43.50	6.06	44.70	5.28
I	47.30	5.13	47.80	5.17	46.10	6.56	48.50	5.31
M	42.80	4.37	43.60	5.43	43.10	5.77	44.10	6.20

Note: TS=truth-seeking; OM=Openmindedness; A=Analyticity; S=Systematicity; SC=Self-confidence; I=Inquisitiveness; M=Maturity

Gender and Critical-thinking Disposition

The aggregate data by Facione and Facione (1997) only measured gender differences through cross-section data and not longitudinal data. These data revealed almost no difference in CCTDI means for entering undergraduate students (Males *n*=109; Females *n*=839). Openmindedness (t[1000]=2.23, $\acute{\eta}^2$ =.01) and maturity (t[990]=2.64, $\acute{\eta}^2$

=.01) were the only two subscales that demonstrated statistically significant higher means for females over males entering the undergraduate program but yielded a small level of practical importance.

The researchers suggested that the most reasonable conclusion for these results is that males and females have not only an equal distribution on the CCTDI entering an undergraduate nursing program but also demonstrated consistently weak and strong ranges for the CCTDI. Upon exit of the undergraduate program, both genders (Males *n*=64; Females *n*=479) show improvement, but males recorded statistically significant higher scores in overall CCTDI (t[542]=2.91, $\acute{\eta}^2$=.02) and in three of the seven subscales. The three subscales were truth-seeking (t[542]=4.13, $\acute{\eta}^2$ =.03), analyticity (t[542]=2.77, $\acute{\eta}^2$ =.01), and maturity (t[542]=2.79, $\acute{\eta}^2$ =.01). All of the subscales and overall means that demonstrated statistical significance yielded a small measure of practical importance.

Although the aggregate data suggest differences in genders, results of studies conducted where gender has been a variable have been mixed. Giancarlo and Facione (2001), Walsh and Hardy (1999), and Facione, Sanchez, Facione, and Gainen (1995) obtained similar results in their studies as was obtained in Facione and Facione's (1997) aggregate data study. All reported both higher means for females than males for the openmindedness and maturity subscales, but none of the aforementioned studies reported statistical significance gender differences for overall CCTDI scores, whereas Thompson and Rebeschi (1999) and Giddens and Gloeckner (1995) reported no difference in gender scores on the CCTDI or any of the subscales. Thompson and Rebeschi and Giddens and Gloeckner posited that the small sample size in both of their studies may explain why

their results differed from those of the aggregate data set by Facione and Facione, Walsh and Hardy, or Facione et al.

Some of the researchers suggested that the differences in gender results from study to study may simply be an artifact of the sample or other factors not accounted for in their studies (Giancarlo & Facione, 2001; Giddens & Gloeckner, 1999). It appears that there remains considerable ambiguity related to gender differences on the CCTDI. The two studies investigating athletic training students and professionals found no statistically significant differences in gender compared with overall CCTDI and subscale means (Leaver-Dunn et al., 2002; Racchini, 2007). The current study investigated whether or not gender differences exist on the CCTDI and associated subscales. The next section presents research related to differences between individuals with or without RN-licensure or other certifications upon entry into an educational program and results on the overall CCTDI and associated subscales.

RN Licensure Status and Critical-thinking Disposition

The results of the aggregate data set by Facione and Facione (1997) were that students who enter a program with or without an RN license had an overall mean greater than 280. This cutoff range suggests a positive disposition in overall critical-thinking disposition; however, students with RN license at entry had a higher overall CCTDI mean than those students without RN license upon entry (Table 10).

All subscales for both RN and non-RN license upon entry into the nursing program recorded means above 40 except truth-seeking for non-RN licensed students. Additionally, students with an RN license upon entry, on average, had statistical

Table 10

Means and Standard Deviations for Registered Nurses and Nonregistered Nurses at Entry to a Nursing Program on the Overall CCTDI and Associated Subscales

Subscale	Statistic	RN at Entry	Without RN at Entry
TS	*M*	40.63	37.53
	SD	5.93	5.76
	n	245	978
OM	*M*	45.11	44.63
	SD	5.30	4.76
	n	245	982
A	*M*	44.14	43.35
	SD	5.23	5.49
	n	244	969
S	*M*	44.33	43.12
	SD	5.51	5.89
	n	244	982
SC	*M*	42.76	42.97
	SD	5.76	6.11
	n	244	983
I	*M*	48.92	47.71
	SD	5.28	5.93
	n	244	980
M	*M*	47.64	45.63
	SD	5.32	5.77
	n	244	972
Total	*M*	312.80	305.20
	SD	21.40	28.20
	n	333	930

Note: TS=Truth-seeking; OM=Openmindedness; A=Analyticity; S=Systematicity; SC=Self-confidence; I=Inquisitiveness; M=Maturity

significantly higher scores for truth-seeking (t[244]=7.49, $\acute{\eta}^2$ =.17), analyticity (t[243]=2.01, $\acute{\eta}^2$ =.02), systematicity (t[243]=2.85, $\acute{\eta}^2$ =.03), inquisitiveness (t[243]=2.91, $\acute{\eta}^2$ =.03), maturity (t[243]=4.94, $\acute{\eta}^2$ =.09), and overall CCTDI (t[332]=4.46, $\acute{\eta}^2$ =.06) when compared with students without an RN license at program entry.

Overall CCTDI and maturity results yielded a medium level of practical importance, truth-seeking yielded a large level of practical importance, and analyticity, systematicity, and inquisitiveness yielded small levels of practical importance. Facione

and Facione (1997) hypothesized that these results were reflective of returning RNs possessing a higher level of critical-thinking disposition related to their additional experience level and age. These students had elected to return for further education; therefore, the results could be related to a self-selection effect.

The results upon exit of the program are very different than one would expect (Table 11).

Table 11

Means and Standard Deviations for Registered Nurses and Nonregistered Nurses at Exit from a Nursing Program on the Overall CCTDI and Associated Subscales

Subscale	Statistic	RN at Entry	Without RN at Entry
TS	*M*	38.75	38.69
	SD	5.08	4.31
	n	273	461
OM	*M*	43.86	46.27
	SD	4.93	4.36
	n	272	462
A	*M*	44.25	44.00
	SD	4.95	3.96
	n	271	462
S	*M*	43.74	44.25
	SD	5.85	4.49
	n	270	462
SC	*M*	44.04	45.13
	SD	6.03	4.97
	n	272	462
I	*M*	48.36	49.48
	SD	5.79	4.15
	n	272	462
M	*M*	46.57	46.46
	SD	5.26	4.17
	n	272	461
Total	*M*	309.30	315.20
	SD	26.50	19.70
	n	267	461

Note: TS=Truth-seeking; OM=Openmindedness; A=Analyticity; S=Systematicity; SC=Self-confidence; I=Inquisitiveness; M=Maturity

The overall mean for RNs upon exiting the program was lower, whereas the overall mean for non-RN license upon exit was increased. Furthermore, non-RN students had statistically significantly higher values on average in openmindedness (t[461]=6.88, $\acute{\eta}^2$ =.09), inquisitiveness (t[461]=3.02, $\acute{\eta}^2$ =.02), and overall CCTDI scores (t[460]=3.45, $\acute{\eta}^2$ =.02) than their RN licensed counterparts (Facione & Facione, 1997). These results yielded low levels of practical importance except for openmindedness that achieved a medium level of practical importance.

Facione and Facione (1997) suggested that the differences in the overall CCTDI and the subscales upon entry could be attributed to the fact that the mean age of the RN licensed sample was 33.58, whereas the mean age of the non-RN sample was 25.28, but they could not explain the drop in scores, on average, that occurred in RN licensed students upon exit.

It was suggested that the difference in entry scores may be attributed to normal gains seen as individuals develop in their adult years rather than RN status or as they gain experience in the nursing field, but Facione and Facione could not offer any other explanation for the average drop in scores for RN status students upon exiting of the program.

Shin, Jung, Shin, and Kim (2006) attained results opposite to that of the aggregate data set by Facione and Facione (1997). Their descriptive statistics for nursing students in associate (n=137), bachelors of science in nursing (n=102), and RNs returning for a bachelor's degree (n=66) all have scores on average below 280 on the overall CCTDI suggesting ambivalence regardless of program (Table 12).

Table 12

Means and Standard Deviations Broken Down by Overall, Associate Degree, Bachelors of Science Degree in Nursing (BSN), or Registered Nurses Returning for a Bachelors of Science Degree in Nursing (RN-BSN) on the Overall CCTDI and Associated Subscales

Subscale	Statistic	Overall CCTDI *n*=306	Associate *n*=137	BSN *n*=102	RN-BSN *n*=66
TS	*M*	30.12	29.91	31.12	29.00
	SD	4.06	3.71	4.06	4.85
OM	*M*	36.91	37.45	36.54	36.36
	SD	3.35	3.44	3.34	3.02
A	*M*	40.42	39.87	41.01	40.67
	SD	4.09	4.08	3.60	4.69
S	*M*	35.70	35.38	36.07	35.79
	SD	4.19	4.10	4.29	4.19
SC	*M*	40.98	40.09	41.44	42.12
	SD	5.12	5.24	4.95	4.87
I	*M*	44.64	44.20	45.32	44.50
	SD	5.19	4.89	5.50	5.25
M	*M*	34.43	34.15	35.90	32.71
	SD	5.20	4.56	4.71	6.46
Total	*M*	263.20	261.05	267.40	261.15
	SD	18.24	16.59	18.78	19.70

Note: TS=Truth-seeking; OM=Openmindedness; A=Analyticity; S=Systematicity; SC=Self-confidence; I=Inquisitiveness; M=Maturity

The overall mean for the three groups were below the 280 cutoff point for positive disposition with the self-confidence and inquisitiveness the only subscale means for all three groups above 40. The only exception was analyticity for RNs and bachelors degree programs. Overall CCTDI means revealed that RNs returning for a bachelors degree and associate degree nursing students demonstrated a statistically significant difference over their bachelors enrolled nursing students ($F[1,302]=4.16$, $\acute{\eta}^2 = .01$). The measure of practical importance is small.

All three groups in Shin's et al. study had lower means on the truth-seeking subscale than what was reported in Facione and Facione's aggregate data (*M*=30.12; *SD*=4.06 vs. *M*=40.63; *SD*=5.93 in the aggregate data set). Cultural differences and

instructional differences were offered by Shin et al. as possible explanations for this finding. Previous studies have suggested that licensed RNs appear to score higher on the CCTDI than their non-RN licensed counterparts upon entry into a nursing program; however, cultural and instructional differences have been suggested, specifically between Far Eastern students and North American students, for lower CCTDI scores regardless of licensing status.

There have been no previous studies in the field of athletic training that have investigated whether or not overall CCTDI or associated subscales change depending upon an athletic trainer's licensure status. The current study investigated if a difference exists between certified and noncertified athletic training graduate students. The next section examines research related to academic performance and CCTDI scores.

Grade Point Average and Critical-thinking Disposition

The results of the original aggregate data sets by Facione and Facione (1997) yielded no relationship between grade point average (GPA) and overall CCTDI scores or any of the subscale scores. These results were similar to Thompson and Rebeschi (1999) who found no relationship between GPA and overall CCTDI or any of the subscales (n=38), whereas Stewart and Dempsey (2005) found inconsistent results on some of the CCTDI subscales. Stewart and Dempsey investigated the relationship between GPA and CCTDI of second-semester sophomores, first- and second-semester juniors, and first- and second-semester seniors. The GPA of second-semester sophomores and second-semester juniors were statistically significantly positively correlated with the openmindedness subscale, but the magnitude of the correlates coefficient is small (Table 13).

Table 13

Correlations Broken Down by Class Level and Overall CCTDI and Associated Subscales Correlated with GPA

Class Level	*n*	TS	OM	A	S	SC	I	M	Total
Sophomore 2nd Semester	55	-	.28	-	-	-	-	-	-
Junior 1st Semester	49	-	-	-	-	-	-	.29	.30
Junior 2nd Semester		-	.39	-	.39	-	-	-	-
Senior1st Semester	36	-	-	-	-	-.51	-	-	-
Senior2nd Semester	34	-	-	-	-	-	-	-	-

Note: TS=Truth-seeking; OM=Openmindedness; A=Analyticity; S=Systematicity; SC=Self-confidence; I=Inquisitiveness; M=Maturity; All results are statistically significant.

First-semester juniors' GPAs were positively correlated with overall CCTDI and maturity subscale. Finally, second-semester juniors demonstrated a positive correlation on the systematicity subscale, whereas first-semester seniors demonstrated a negative correlation with GPA on the self-confidence subscale. No reason was provided by the researchers for such erratic results but the number of participants at the commencement of the study was very small and attrition may have been a factor in their longitudinal study.

The aforementioned two studies and aggregate data set contradict the findings of Ip et al. (2000) and Giancarlo and Facione (2001) who both found statistically significant relationships between GPA and overall CCTDI. Giancarlo and Facione (2001) found openmindedness (r=.15), analyticity (r=.10), systematicity (r=.09), and maturity (r=.09) statistically significantly correlated with GPA, whereas truth-seeking, self-confidence, and inquisitiveness were not significantly correlated (n=1,117). The mean GPA for the data set was 3.02 (SD=.46). Similar results were attained by Ip et al. (2000) for openmindedness (r=.26), analyticity (r=.30), systematicity (r=.35), as well as self-confidence (r=.23) and inquisitiveness (r=.28) subscales but not for the truth-seeking

subscale (*n*=122). Mean GPA was not provided for this study. Leaver-Dunn et al. (2002) and Racchini (2007) both found no statistical significance between GPA and CCTDI scores for athletic-training students or certified professionals in athletic training. It is difficult to assess whether GPA is related to CCTDI scores with the available research data, but there appears to be a positive correlation but small. The current study examined whether or not a student's undergraduate GPA correlates with higher CCTDI and associated subscale results. The next section addresses high-stakes testing pass or fail rates and critical-thinking disposition.

High-stakes Testing (*Registered Nurse-National Certification Licensing Examination) Pass or Fail Rate and Critical-thinking Disposition*

A relationship between RN-NCLEX pass or fail rates and CCTDI scores were not available from the aggregate data set, and only one study by Giddens and Gloekner (2005) who used paired data (*n*=184) to investigate if a relationship exists. The lack of studies investigating CCTDI scores and success on such a high-stakes test is surprising because some researchers have suggested how important critical thinking is to the success on the RN-NCLEX examination and is one of the most emphasized concepts in the field of nursing (Wendt & Brown, 2000).

The results attained by Giddens and Gloekner (2005) suggest that students who passed the RN-NCLEX had statistically significantly higher scores on average on the overall CCTDI ($t[183]=2.6$, $\acute{\eta}^2=.04$), truth-seeking ($t[183]=2.7$, $\acute{\eta}^2=.04$), openmindedness ($t[183]=2.4$, $\acute{\eta}^2=.03$), systematicity ($t[183]=2.2$, $\acute{\eta}^2=.03$), and maturity ($t[183]=3.6$, $\acute{\eta}^2=.07$) subscales than students who failed the RN-NCLEX, but a small level of practical importance was attained except for maturity, which attained a medium level of practical

importance. Additionally, Giddens and Gloekner (2005) found a statistically significant relationship between student's GPAs who passed the RN-NCLEX (t[209]=5.3, $\acute{\eta}^2$ =.12) and those who failed. Additionally, this relationship had a medium level of practical importance. It should be noted in this study the pass rate on the RN-NCLEX examination was 93% at this particular institution, whereas the National average is 85% at the time of the article publication. The mean GPA was not provided for this data set.

From the limited number of studies investigating pass or failure rates on the RN-NCLEX and CCTDI scores, an assessment as to whether or not a relationship exists is difficult at this time. Giddens and Gloekner (2005) acknowledged the lack of research and suggested this relationship be examined more closely because RN-NCLEX pass rate is an important benchmark of a nursing program's success. Racchini (2007) investigated whether or not the number of times needed to pass the National Athletic Training Board of Certification (NATABOC) examination is related to results on the CCTDI and associated subscales. Racchini found no correlation between the number of times needed to pass the NATABOC and results on the CCTDI and associated subscales. The current study examined whether or not the number of times a student needs to pass the NATABOC examination is related to his or her results on the CCTDI and associated subscales.

Summary

Athletic training is a profession no different than many other healthcare professions. Many other professions, such as nursing and physical therapy, have recognized the need to assess whether or not critical thinking is being taught both in the didactic and clinical settings at not only the undergraduate level but also at the graduate

level. Facione and Facione (1997), Lederer (2007), Miller (2003), and Phillips, Chesnut, and Respond (2004) investigated critical-thinking development at the graduate level, which yielded greater mean overall scores and subscale scores when compared with their undergraduate counterparts. In some studies, variables such as age, GPA, success rate on high-stakes testing, and experience have all demonstrated a positive relationship with critical-thinking disposition (Facione & Facione; Giancarlo & Facione, 2001; Giddens & Gloekner 2005; Ip et al., 2000; Stewart & Dempsey, 2005).

Results of previous studies investigating age and experience have yielded, on average, the highest overall CCTCI means as well as the highest means on many subscales (Hicks et al., 2003; Leppa, 1997; Yeh & Chen, 2003). Hicks et al., Leppa, and Yeh and Chen have posited that as students and professionals attain greater experience his or her level of critical-thinking disposition increases. Additionally, Facione and Facione (1997) investigating longitudinal results using matched-paired samples on the CCTDI have found an increase as a student progresses through class levels. Furthermore, Bartlett and Cox (2000, 2002) investigated whether or not clinical rotation experience increases CCTDI and the results have revealed an increase in overall CCTDI. Age and experience have a relationship with overall CCTDI and subscale scores.

Many nursing and physical therapy programs are assessed on pass or fail rates on high stakes testing or licensure tests on the quality of the program. Only one published study by Giddens and Gloekner (2005) demonstrated that students who pass licensure exams typically have higher overall CCTDI and subscale results than students who did not pass. Additionally, the same researchers found a statistically significant relationship between GPA, pass rates on the RN licensure examination, and overall CCTDI results.

Assuming that a graduate or master's degree in athletic training from an accredited graduate program builds upon a baccalaureate degree, then comparable improvements in critical-thinking disposition should be expected as was the case in studies investigating the overall CCTDI and subscale scores in graduate-nursing, graduate-pharmacology, and graduate-occupational therapy fields (Facione & Facione, 1997; Lederer, 2007; Miller, 2003; Phillips et al., 2004). Additional research is needed to elucidate if critical-thinking dispositions are being nurtured and advanced at the graduate level in athletic training. The current descriptive study expanded on the previous investigations using graduate students in addition to comparing graduate athletic-training students with their undergraduate counterparts. Results of these studies may assist program directors in assessing the effectiveness of instruction, curriculum, and student acquisition of critical-thinking abilities.

CHAPTER III

METHODOLOGY

The purpose of this cross-sectional descriptive study was to measure critical-thinking dispositions of postprofessional graduate athletic-training students in accredited postprofessional graduate athletic-training programs using the California Critical Thinking Disposition Inventory (CCTDI). The results were comprised of an overall CCTDI score and all seven subscales: truth-seeking, open-mindedness, analyticity, systematicity, critical-thinking self-confidence, inquisitiveness, and cognitive maturity. The previous two chapters have addressed the context, framework, and the relevant research providing the foundation for the current study. This chapter addresses the research design, instrumentation, procedures, sample, and methods for analyzing the data, and protection of human subjects.

Research Design

This cross-sectional descriptive study assessed critical-thinking disposition of 113 postprofessional graduate athletic-training students in National Athletic Training Association (NATA) approved graduate programs. Demographic and descriptive information were obtained for comparison and statistical analysis. All 16 postprofessional graduate program directors in the United States were contacted for their agreement to participate in the study and administer the CCTDI. The study was conducted only in those schools whose program directors agreed to participate. Eleven agreed to participate in the current study, but data were only collected from seven postprofessional graduate programs.

At the beginning of the Spring 2010 semester in a classroom setting, postprofessional graduate directors distributed and administered the CCTDI, the associated demographic sheet, and the article on critical-thinking in graduate education. The program directors ensured the testing environment was well lighted and all graduate students had a #2 pencil. After the graduate students were provided an opportunity to read the participant consent letter, the letter then was read aloud to them. Additionally, program directors explained to the participants that their participation was optional and that their student identification number was required only if he or she wishes to receive his or her test results. If a student did not wish to participate, he or she was directed to read the critical thinking in graduate education article provided.

The current descriptive investigation was a study of critical-thinking disposition of graduate athletic-training students. Data were collected through participants' completion of the CCTDI and associated demographics sheet specifically designed for this current study. The independent variables were age, undergraduate grade point average (GPA), gender, certified or noncertified athletic trainer at the time of the inventory, first- or second-year graduate students, number of times needed to pass the BOC athletic training certification exam, and the number of years as a certified athletic trainer.

The dependent variable was the California Critical Thinking Disposition Inventory (CCTDI). The CCTDI is an instrument that has a 6-point Likert format ranging from 1 (*strongly agree*) to 6 (*strongly disagree*). Each of the 75 questions were separated further into one of seven different categories or subscales. The subscales of the CCTDI are truth-seeking, inquisitiveness, open-mindedness, critical-thinking self-confidence,

analyticity, systematicity, and cognitive maturity. Because of proprietary limitations, the exact number of questions representing each subscale is unknown, but each subscale has or is composed of between 8 and 12 questions on the CCTDI.

The program directors agreeing to have their students participate in the study administered the CCTDI to all first- and second-year postprofessional graduate athletic-training students in their programs during the beginning of the Spring 2010 semester. Upon gathering these profiles, the overall CCTDI and subscale scores were correlated with the following variables to ascertain whether or not relationships exist. These variables were age, undergraduate grade point average (GPA), gender, certified or noncertified at the time of the inventory, number of times needed to pass the Board of Certification (BOC) athletic training certification examination, first- or second-year graduate students, and number of years as a certified athletic trainer.

Sample

All 16 postprofessional graduate athletic-training programs were solicited for participation in the study with 11 responding and completing the consent to participate form. Of the 11 graduate athletic-training programs, 7 administered the CCTDI and associated demographic sheet and returned the results for statistical analysis. All seven of the participating programs had every one of their graduate students complete the CCTDI.

All of the participating schools are co-educational 4-year institutions with a combined undergraduate and graduate enrollment of over 10,000 students. Four of the schools are located in the Midwest, two are located on the East Coast, and one is located on the West Coast (Table 14).

Table 14

Demographic Information for the Seven Postprofessional Graduate Athletic Training Participating Programs

Graduate School	One-or Two- Year Program	Number of Participants (*n*=113)	Location
School 1	Two-year program	19	Midwest
School 2	Two-year program	6	Midwest
School 3	Two-year program	24	West Coast
School 4	Two-year program	15	East Coast
School 5	Two-year program	13	Midwest
School 6	One-year program	21	Midwest
School 7	One-year program	15	East Coast

One-hundred thirteen graduate students completed the CCTDI and associated demographic sheet. All participants were in either their first or second year of their postprofessional graduate studies at an NATA accredited program. All students were either a certified athletic trainer or have met all the clinical and coursework prerequisites of their institutions to be eligible to sit for the NATABOC examination. Two of the seven graduate programs were one-year programs (*n*=36), whereas the other five are 2-year graduate programs (*n*=77). Out of the five graduate programs offering a 2-year program (*n*=77), 39 students (50.6%) were in their first year of matriculation, whereas 38 students (49.4%) were in their second year. Thirty-six of the participants attended a one-year graduate program. The study was conducted only in those schools whose program directors agreed to participate. Program directors solicited graduate athletic-training students to participate in the study.

The gender ratio (Table 15) attained in the current study is not reflective of the gender ratio attained in the National Athletic Training Association (2004) role delineation study (55.2% male and 44.8% female), and a majority of participants were under the age

of 30. In addition, a majority of the participants were certified 2 years or less. Almost all of the participants were certified athletic trainers.

Table 15

Frequencies and Percentages for Gender, Age, Certification Status, Success Rate on Board of Certification (BOC) Examination, Number of Years Certified, and Undergraduate GPA for 113 Postprofessional Graduate Student Athletic Trainers

Variables	*f*	%
Gender		
Male	49	43.4
Female	64	56.6
Age		
21-30 years old	110	97.3
31-40 years old	2	1.8
> 40 years old	1	0.9
Certification status		
Certified	107	94.7
Non-certified	6	5.3
Number of years certified		
0-2 years	94	83.2
3-5 years	11	9.7
6-10 years	2	1.8
> 10 years	0	0.0

Academic components assessed were the number of attempts needed to pass the BOC certification examination and undergraduate GPA (Table 16). A majority of graduate students reported successfully passing the certification examination on the first attempt. In addition, a majority of participants reported having an undergraduate GPA of 3.51 or greater.

Protection of Human Subjects

The researcher complied with the American Psychological Association (2002) protection of human subject's guidelines. Approval for the research was granted by the

Institutional Review Board for the Protection of Human Subjects at the University of San Francisco (IRB).

Table 16

Success Rate on BOC Examination and Undergraduate GPA Reported for 113 Postprofessional Graduate Student Athletic Trainers

Variables	*f*	%
Success rate on BOC examination		
Pass 1st attempt	58	51.3
Pass 2nd attempt	33	29.2
Pass 3 or greater attempts	16	14.2
Undergraduate GPA		
2.00-2.50	0	0.0
2.51-3.00	7	6.2
3.01-3.50	46	40.7
3.51-4.00	60	53.1

Written permission was obtained from all graduate athletic-training program directors from all institutions choosing to participate. All graduate athletic-training students were provided with a cover letter (Appendix A) that stated the general intention of the study along with a request for participation. Participants were informed that they would be taking a 15- to 20-minute inventory and his or her participation was voluntary. Anonymity was protected for students by not requiring any identifying information. For those students requesting their results, they provided their student identification numbers on their CCTDI tests. If a participant chose to inquire about his or her score on the CCTDI, the student identification number allowed participants to request his or her individual score from the researcher. The researcher did not have access to any identification numbers and associated names. Students requesting results were provided their results and interpretation of those results in a sealed envelope with their student

identification number on the outside of the envelope for distribution by program directors.

Program directors assured graduate students that individual results would not be shared with them and only were known to the researcher. Overall results were shared with the program directors, but individual results were provided only to respective individual participants upon request. All CCTDI testing material, results, and demographic sheets were kept under lock and key and only accessible by the researcher.

There were no anticipated risks to participants associated with this study. Participants were assured anonymity and were assured that their decision to participate or not to participate would not affect their status in their graduate program.

Instrumentation

Two instruments were used in the proposed study. The first was the California Critical Thinking Disposition Inventory and the second was a demographic sheet. The first instrument was designed by Facione and Facione (1992), and the second was designed by the researcher for use in the study.

CCTDI

The CCTDI is a widely used instrument in the field of nursing for evaluating critical-thinking disposition but is not specific for nursing. The purpose of the discipline-neutral instrument is to measures one's disposition or attitude toward critical thinking for high-school students, college students, and adults. The CCTDI was developed from a 2-year Delphi study in which 46 experts in the fields of education, philosophy, social

sciences, and physical sciences developed a definition for critical-thinking dispositions (Facione, 1990).

The development of the CCTDI began with the Delphi project compiling 19 dispositional phrases of an ideal critical thinker. Ten to 15 pilot questions were written for each phrase for a total of 250 items. Each item was written so to elicit an equal number of positive and negative responses. Two-hundred-fifty of the items were assessed by college-level critical-thinking educators for ambiguity, readability, and consistency of interpretation. Out of the original 250 items, 150 items were retained and pilot tested at two universities in the United States and one university in Canada. From the 150 items remaining, item-total correlations were used to remove any ambiguous or unclear items. The final CCTDI contains 75 discipline-neutral questions.

The CCTDI uses a 6-point Likert format ranging from 1 (*strongly agree*) to 6 (*strongly disagree*). Each of the 75 questions are separated further into one of seven different categories or subscales. The subscales of the CCTDI are truth-seeking, inquisitiveness, open-mindedness, critical-thinking self-confidence, analyticity, systematicity, and cognitive maturity. Each subscale is represented on the CCTDI with between 8 and 12 questions. The maximum score in each subscale is 60, and a minimum score in each subscale is 10. A score of 30 or less is interpreted as opposition or weakness on the respective subscale, a score of between 31 and 40 indicates ambivalence toward the respective subscale, a score between 41 and 50 indicates a positive inclination toward critical-thinking disposition, and a score greater than 50 indicates a high inclination or disposition toward the respective subscale. An overall score is compiled by summing all of the seven subscales and results in a minimum score of 70 points and a maximum score

of 420 points. A score greater than 280 indicates a positive disposition toward critical-thinking, whereas a score of 210 or less indicates a negative inclination toward overall critical-thinking disposition (Giancarlo & Facione, 2001).

Truth-seeking, the first subscale, assesses one's eagerness to seek the best information in any given context, one who is not afraid to ask probing or inquisitive questions, and who will explore other inquiries even if they are different from their own views, preconceived ideas, or opinions (Facione, Facione, & Sanchez, 1994). An athletic trainer who is a good truth-seeker will be open to new information and data to provide the best possible care for his or her athlete. Someone who is not a strong truth-seeker will fail to assess counterevidence and rely solely on habit rather than evidence-based theory. An example of a truth-seeking item is, "The truth depends on your point of view."

The next subscale, inquisitiveness, assesses one's academic and intellectual curiosity. Inquisitiveness specifically identifies one's affinity for seeking information and knowledge even when the reason for using it is not apparent (Facione et al., 1994). An athletic trainer limited in their inquisitiveness would not have the ability to develop his or her knowledge base or clinical abilities. "Other's admire my intellectual curiosity and inquisitiveness" is an item on the inquisitiveness scale.

The third subscale, systematicity, assesses one's inclination toward organized, structured, and planned inquiry (Facione et al., 1994). An athletic trainer who uses systematicity effectively will be less likely to be negligent and miss valuable information as a clinical practitioner. An example systematicity item is, "It's easy for me to organize my thoughts."

The following subscale, analyticity, assesses the use of reasoning and evidence-based practice to solve problems, and most importantly, foresee future problems and the ability to intervene when necessary (Facione et al., 1994). Athletic trainers who exercise sound analyticity are able to connect clinical situations with their theoretical knowledge base and anticipate events deleterious to their athletes. An example of an analyticity item is, “I look for facts that support my views, not facts that disagree.”

Open-mindedness, the fifth subscale, measures acceptance of opposing views from their own preconceived biases (Facione et al., 1994). Athletic trainers work as a team with other healthcare professions, they must be open to other opinions and views without allowing any personal biases to affect the care they provide to their athletes. “It’s important to me to understand what other people think about things” is an item in the fifth subscale.

The following subscale, critical-thinking self-confidence, identifies the faith one places in his or her own abilities. Trusting in one’s clinical reasoning and clinical judgment are paramount in being an effective clinician. Athletic trainers need to trust that their abilities and theoretical knowledge will be sufficient to deal with any given situation. An example of critical-thinking self-confidence in the CCDTI test is the question, “People think I procrastinate about making decisions.”

The final subscale, maturity, measures how cautious one is in their decision-making ability (Facione et al., 1994). An athletic trainer who is clinically mature will approach problems and decision-making knowing that there is more than one option of care and sometimes clinical judgments are made based solely on evidence, contexts, and

situations in which the outcome is not known with any certainty. “Life has taught me not to be too logical” is a maturity subscale item.

Validity

The 75-item inventory underwent a factor analysis to assess item validity (Facione et al., 1994). Factor loadings for individual subscale items (sample *n*=164) were reported for ranges only. The subscale items ranged between .18 to .59 for truth-seeking, ranged between .19 to .69 for open-mindedness, ranged between .03 to .58 for analyticity, ranged between .34 to .61 for systematicity, ranged between .37 to .66 for self-confidence, ranged between .33 to .65 for inquisitiveness, and ranged between .23 to .68 for maturity (Facione et al.). The lower boundaries of the ranges reported on the all of the CCTDI subscales would not be acceptable evidence that the item loaded on that particular factor and also calling into question the validity of the results of the factor analysis based on such a small sample size. Two of the subscales had low factor loadings (analyticity and open-mindedness), but because they had high face validity and contributed to the overall reliability of the scale, they were preserved. Because there are no other known measures of critical-thinking disposition, convergent validity was not possible at the time of the instrument development (Facione et al.).

Facione et al. (1994) noted that face validity in an attitudinal measurement tool may not be desirable because it would allow for the potential of socially desirable responses. Facione et al. suggested that the CCTDI does discriminate between respondents. Although the CCTDI is widely used to assess critical-thinking disposition, researchers have questioned the usefulness, generalizability, validity, and reliability of the inventory (Callahan & Ochoa, 2007).

Reliability

Facione et al.'s (1994) initial pilot results (*n*=567) with undergraduate college students revealed Cronbach's coefficient alpha reliabilities for the seven subscales between .71 to .80 with an overall reliability of .91. Another study with a much larger sample size (*N*=1,019) of undergraduate college students revealed consistent Cronbach's coefficient alpha reliability levels of .60 to .78 for the subscales and .90 overall (Facione et al.). Although the CCTDI is widely used to assess critical-thinking disposition, researchers have questioned the usefulness, generalizability, validity, and reliability of the inventory (Callahan & Ochoa, 2007).

Demographic Sheet

The researcher developed the demographic sheet consisting of age, undergraduate grade point average (GPA), gender, certified or noncertified athletic trainer at the time of the inventory, number of times needed to pass the BOC athletic training certification exam, first- or second-year graduate students, if he or she is a certified athletic trainer, and, if he or she is certified, the number of years as a certified athletic trainer (Appendix B).

The age variable had three categories: 21 to 30 years of age, 31 to 40 years of age, and greater than 40 years of age. The second variable, undergraduate GPA, had four categories: 2.00 to 2.50, 2.51 to 3.00, 3.01 to 3.50, and 3.51 to 4.00. The next three variables, gender, certified or noncertified, and first- or second-year graduate students, had two categories of either male or female, certified or noncertified, or first- or second-year status, respectively. Some institutions offer only a one-year program; in these cases,

the data were not used for assessing differences between first- and second-year graduate students and CCTDI results. The number of times needed to pass the BOC was the fifth variable and had three categories: one, two, or three or more. Finally, the number of years a certified athletic trainer had four categories: 0 to 2 years, 3 to 5 years, 6 to 10 years, and greater than 10 years.

Data-collection Procedure

All 16 postprofessional graduate program directors in the United States were contacted for their agreement to participate in the study and administer the CCTDI. The proposed study was conducted only in those schools whose program directors agree to participate. The names of the associated program directors were obtained through Internet sources. Around December 2009, an invitation letter was electronically sent to all postprofessional graduate program directors (Appendix C) explaining the purpose of the study and an invitation to participate. If he or she chose to participate, another more formal consent letter was mailed electronically to the program director. Once approval was received from the program director for participation and the consent to participate returned to the investigator, all the necessary paperwork was submitted to the institutional review board for the protection of human subjects (IRB) and approval was obtained from the University of San Francisco. One university required IRB approval from their particular institution. In this case, all the necessary paperwork was submitted, and approval was obtained prior to any data collection.

In January 2010, CCTDI tests were mailed out to all seven postprofessional graduate athletic-training programs who chose to participate along with separate demographic sheets for each participant, an invitation letter to be read by all participants

explaining consent, written training instructions for administering the CCTDI for all program directors (Appendix D), and a critical-thinking in graduate education article for all participants to keep regardless if they choose to participate or not. The program directors were responsible for testing security as outlined in the testing manual.

At the beginning of the Spring 2010 semester in a classroom setting, postprofessional graduate directors distributed and administered the CCTDI, the associated demographic sheet, and the article on critical-thinking in graduate education. The program directors ensured the testing environment was well lighted and all graduate students had a #2 pencil. After the graduate students were provided an opportunity to read the participant consent letter, the letter then was read aloud to them. Additionally, program directors explained to the participants that their participation was optional and that their student identification number was required only if he or she wishes to receive his or her test results. If a student did not wish to participate, he or she was directed to read the critical thinking in graduate education article provided.

The program director distributed the CCTDI, associated demographic sheet, and the critical thinking in graduate education article. Those students who chose to receive their results in a sealed envelope continued by filling in his or her student identification number on the answer sheet provided. The participants were instructed not write his or her name on the answer sheet. Students not wishing to participate were offered the critical-thinking in graduate education article. The proctor read aloud the two examples inside the front cover of the CCTDI and then directed the persons being tested to the answer sheet to review how the example responses were marked. The proctor then read

aloud directions 13 through 17 from the CCTDI test manual (located on page 11) to all participants.

After completion of the CCTDI and the demographic sheet, program directors returned all the forms in an addressed and stamped envelope to the researcher. The participants were instructed to keep the article. Once the researcher received all of the CCTDI testing sheets, all of them were sent to Insight Assessment for scoring.

Previous studies using the CCTDI and athletic trainers suggested that the paper-and-pencil may yield better results. Racchini (2007) used the Internet form of the CCTDI and had a response rate of 13% (over 4,000 electronic mail invitations were sent out) and had issues with the web-based Java system currently used by Insight assessment. It is for these reasons that the CCTDI paper-and-pencil form was used for this study. Total estimated time to complete the CCTDI and the demographic sheet was approximately 20 minutes.

Research Questions

This study addressed the following four research questions:

1. What are the profiles of critical-thinking disposition among postprofessional graduate student athletic trainers and how do they compare with undergraduate athletic-training and certified athletic trainers for CCTDI and associated subscales?

2. To what extent are age and gender related to critical-thinking disposition among postprofessional graduate student athletic trainers as measured by the CCTDI and associated subscales?

3. To what extent are years of certification and first- or second-year graduate students' status related to critical-thinking disposition as measured by the CCTDI and associated subscales?

4. To what extent are undergraduate grade point average, number of times needed to pass the BOC examination, and certification or noncertification status related to critical-thinking disposition as measured by the CCTDI and associated subscales?

Data Analysis

The means and standard deviations were obtained for the CCTDI total score and truth-seeking, open-mindedness, analyticity, systematicity, critical-thinking self-confidence, inquisitiveness, and maturity subscales so that the first research question could be addressed. The results were compared with descriptive results from Racchini's (2007) certified athletic trainer data and from Leaver-Dunn et al.'s (2002) undergraduate athletic-training data, and Cohen's *d* were calculated and compared. The second research question was addressed from data gathered from the demographics questionnaire and means of the CCTDI total score and subscales. A point biserial correlation coefficient was used to investigate the relationship between scores for males and females on the CCTDI and associated subscales. Originally, a correlation ratio was intended to be used to assess the relationship between age categories on the CCTDI and associated subscales, but there were too few in the age categories of 31 to 40 and greater than 40 years old; therefore, a point biserial correlation coefficient was used to assess the relationship. Overall error rate was controlled at the .05 level for the second research question. The

third research question used a point biserial correlation coefficient to analyze the relationship between the scores of first- or second-year students on the CCTDI and associated subscales. As with age, a correlation ratio was intended to be used to assess the relationship between years of certification on CCTDI and associated subscales; learning there were too few respondents in the categories other than 0 to 2 years, the point biserial correlation coefficient was used. Overall error rate was controlled at the .05 level for the third research question. The final research question used a point biserial correlation coefficient to investigate the relationship between certification status and CCTDI and associated subscales. As no one reported an undergraduate GPA between 2.00 to 2.50 and only seven responded in the 2.51 to 3.00 category, a point biserial correlation coefficient was used to assess the relationship between self-reported undergraduate GPA categories, with categories 3.51 to 4.00 and 2.5 to 3.50 and CCTDI and associated subscales. The correlation ratio was used to assess the relationship between the self-reported number of times needed to pass the BOC and CCTDI means and associated subscales. Overall error rate was controlled at the .05 level.

CHAPTER IV

RESULTS

The purpose of this study was to measure critical-thinking dispositions of postprofessional graduate athletic-training students and to establish a critical-thinking disposition profile for graduate athletic-training students in accredited postprofessional graduate athletic-training programs using the California Critical Thinking Disposition Inventory (CCTDI). This profile was comprised of an overall CCTDI score and all seven subscales: truth-seeking, open-mindedness, analyticity, systematicity, critical-thinking self-confidence, inquisitiveness, and cognitive maturity. In addition, associated demographical data were obtained including age, gender, graduate program length (one or 2 years), first or second year in the 2-year program, certification status, number of years certified, number of times needed to pass the Board of Certification (BOC) examination, and undergraduate grade point average (GPA).This chapter contains the results of the statistical analyses in relation to the research questions.

Postprofessional Graduate Athletic-Training Profile

The first research question is “What are the profiles of critical-thinking disposition among postprofessional graduate student athletic trainers and whether or not the profiles are greater than undergraduate athletic trainers’ and certified athletic trainers’ CCTDI and associated subscales?” To address this first research question, frequencies and percentages for categorized total CCTDI and associated subscales were tabulated (Table 17). In Table 18 are the means, standard deviations, and effect sizes for the current study that were compared with data reported for undergraduate athletic training students

(Leaver-Dunn, Harrelson, Martin, & Wyatt, 2002) and certified athletic trainers (Racchini, 2007).

Table 17

Frequencies and Percentages for Categorized CCTDI Associated Subscales for 113 Postprofessional Graduate Student Athletic Trainers

CCTDI Subscales		Opposition (<30)	Ambivalence (31 to 40)	Positive (41 to 50)	High (>50)
TS	*f*	6	67	40	0
	%	5.3	59.3	35.4	0.0
OM	*f*	3	69	41	0
	%	2.7	61.1	36.3	0.0
A	*f*	0	33	80	0
	%	0.0	29.2	70.8	0.0
S	*f*	4	38	71	0
	%	3.5	33.6	62.8	0.0
SC	*f*	5	48	60	0
	%	4.4	42.5	53.1	0.0
I	*f*	0	30	83	0
	%	0.0	26.5	73.5	0.0
M	*f*	4	36	73	0
	%	3.5	31.9	64.6	0.0

Note: TS=Truth-seeking; OM=Openmindedness; A=Analyticity; S=Systematicity; SC=Self-confidence; I=Inquisitiveness; M=Maturity

Table 18

CCTDI and Associated Subscale Means, Standard Deviations, and Cohen's *d* for 113 Postprofessional Graduate Student Athletic Trainers

Scale	*M*	*SD*	ES Leaver-Dunn et al. (2002)	ES Racchini (2007)
TS	37.94	4.97	.54	-.28
OM	39.58	5.34	-.20	-.33
A	42.82	5.25	-.18	-.25
S	41.85	6.24	.11	-.31
SC	41.13	6.19	-.22	-.60
I	44.35	5.64	-.21	-.51
M	42.53	6.71	.04	-.10
CCTDI Total	290.19	27.69	-.11	-.47

Note: TS=Truth-seeking; OM=Openmindedness; A=Analyticity; S=Systematicity; SC=Self-confidence; I=Inquisitiveness; M=Maturity; The effects size was calculated on the basis of Cohen's *d*

The maximum score in each subscale is 60, and a minimum score in each subscale is 10. A score of 30 or less is interpreted as opposition or weakness in the respective subscale, a score of between 31 and 40 indicates ambivalence toward the respective subscale, a score between 41 to 50 indicates a positive inclination toward critical-thinking disposition, and a score greater than 50 indicates a high inclination or disposition toward the respective subscale. An overall score is compiled by summing all of the seven subscales with the minimum score of 70 points and a maximum score of 420 points. A score greater than 280 indicates a positive disposition toward critical-thinking, whereas a score of 210 or less indicates a negative inclination toward overall critical-thinking disposition (CCTDI Test Manual, 2010).

Truth-seeking

The truth-seeking mean (M=37.94; SD=4.97) is in the ambivalent range as interpreted by the CCTDI test manual. The CCTDI testing manual identifies 26% of graduate students score below a mean of 40 in the truth-seeking category. A majority of participants (59.3%) have scores in the ambivalent range followed by the positive range. No participants obtained a score above 50 on the truth-seeking subscale, and six participants have scores in the negative range.

Openmindedness

The openmindedness mean (M=39.58; SD=5.34) is in the ambivalent range as interpreted by the CCTDI test manual (between 31 to 40). It should be noted, however, that the mean is very close to the cutoff point between ambivalent and positive. The CCTDI testing manual states that, on average, 9% of graduate students should expect to

score below 40 on the CCTDI, which was considerably lower than those reported in the current study. In addition, a majority of participants had a score in the ambivalent range with no participants having a score greater than 50.

Analyticity

In the current study, graduate athletic-training students had a mean of 42.83 (*SD*=5.25) on the analyticity subscale. Fifteen percent of the graduate students have scores below 40 on the CCTDI as identified by the CCTDI testing manual, which is lower than reported in the present study. A majority of the participants in the current study had scores in the positive range, and no participants had scores above 50. No participants had scores in the negative range as identified by the CCTDI testing manual (<30).

Systematicity

The mean recorded for the systematicity subscale in the current study is 41.85 (*SD*=6.24). The CCTDI testing manual suggests that approximately 26% of graduate students score below 40 on the systematic subscale. In the current study, approximately 37% of the participants expect to have scores below 40. None of the participants have scores above 50, and a majority are above 40 and in the positive range.

Self-confidence

The current study revealed a mean for the subscale self-confidence of 41.13 (*SD*=6.19). The CCTDI testing manual suggests that 6% of graduate students have scores below 40 on the self-confidence subscale. The results of the current study indicate that a greater percentage of graduate athletic-training students have scores below 40 than

suggested by the CCTDI manual. Although the results of the current study revealed a greater percentage of participants with scores below 40 than suggested by the CCTDI testing manual, a majority of students have scores above 40 in the positive range.

Inquisitiveness

Graduate athletic-training students have a mean of 44.35 (*SD*=5.64) on the inquisitiveness subscale in the current study. The CCTDI test manual suggests that less than one percent of all graduate students have scores below 40 on this subscale. Although a greater percentage had scores below 40 than suggested by the CCTDI manual, a majority of the graduate students had scores in the positive range (>40).

Maturity

The mean on the maturity subscale for graduate athletic-training students in the current study is 42.53 (*SD*=6.71). The CCTDI test manual suggests that 12% of all graduate students score below 40 on this subscale. The results of the current study indicate that more graduate students scored below 40 than suggested by the CCTDI test manual but a majority of the graduate students have scores in the positive range (>40).

Overall CCTDI

The total mean for the CCTDI is 290.19 (*SD*=27.69) and is on the lower aspect of the positive range of scores identified by the CCTDI testing manual. The CCTDI test manual does not provided data regarding the percentage of graduate students who score above 280 on the CCTDI.

Comparison Between Undergraduate Athletic Training Students, Certified Athletic Trainers, and Graduate Athletic Training Students

The overall CCTDI results attained in the current study are lower than results by Leaver-Dunn et al. (2002) for undergraduate athletic-training students (*M*=293.15; *SD*=26.05) and by Racchini (2007) for certified athletic trainers (*M*=303.10; *SD*=27.72; Table 19). The overall CCTDI effect size between the current study and the study by Racchini almost achieved a medium negative level of practical importance, whereas there is no practically important difference for the Leaver-Dunn et al. results (Table 18).

Table 19

CCTDI Means and Associated Subscales for Undergraduate Athletic Training Students (UGAT) and Certified Athletic Trainers (ATC)

Study and Sample	Statistics	TS	OM	A	S	SC	I	M	Total
UGAT	*M*	35.10	40.73	43.72	41.13	42.52	45.59	42.23	293.15
(*n*=91)	*SD*	5.66	6.09	4.42	6.44	6.52	5.66	6.51	26.05
ATC	*M*	39.20	41.20	44.10	43.70	44.60	47.20	43.10	303.10
(*n*=258)	*SD*	4.28	4.79	5.15	5.77	5.63	5.58	5.40	27.72

Note: TS=Truth-seeking; OM=Openmindedness; A=Analyticity; S=Systematicity; SC=Self-confidence; I=Inquisitiveness; M=Maturity

Undergraduate athletic-training students (Leaver-Dunn et al., 2002) had, on average, higher scores, on average, on openmindedness, analyticity, self-confidence, and inquisitiveness, but all had a small negative effect size compared with the current study. Graduate athletic training students' truth-seeking, systematicity, and maturity subscales had higher scores, on average, compared with their undergraduate counterparts, but the small effect sizes suggest little practical importance. Graduate athletic-training students had higher scores, on average, in the truth-seeking subscale and a medium effect size

compared with the current study. Certified athletic trainers (Racchini, 2007) had higher scores, on average, on all subscales and a medium negative effect sizes for the self-confidence and inquisitiveness subscales.

Summary

The results of the current study reveal that graduate athletic-training students, on average, had the highest mean on the inquisitiveness subscale (M=44.35; SD=5.64) and the lowest on the truth-seeking subscale (M=37.94; SD=4.97). Five of the seven CCTDI subscales are within the positive disposition range, whereas two of the means for subscales truth-seeking and openmindedness are in the ambivalent range. No participants had scores in the negative range for analyticity or inquisitiveness subscales, and none had greater than 50 for any subscale. A majority of participants had scores in the positive range for analyticity, systematicity, self-confidence, inquisitiveness, and maturity.

Comparisons between the current study and Leaver-Dunn et al. (2002) revealed a medium effect size for truth-seeking, whereas all other subscales had small effect sizes. Effect sizes for self-confidence, inquisitiveness, and overall CCTDI are medium between the current study and Racchini (2007) with all other subscales having a small effect size.

The Relationship between Age, Gender, and Critical-thinking Disposition for Graduate Athletic-training Students

The second research question stated to what extent are age and gender related to critical-thinking disposition among postprofessional graduate-student athletic trainers as measured by the CCTDI and associated subscales. To address this second research question, point biserial correlation coefficients were calculated for age and for gender with CCTDI and associated subscales (Table 20).

Table 20

Point Biserial Correlation Coefficient for CCTDI Total and Associated Subscales and Age, Gender, First- or Second-year Students, Years of Certification, Undergraduate GPA, and Certification Status Categories for 113 Postprofessional Graduate Athletic Training Students

Variables	TS	OM	A	S	SC	I	M	Total
Age	.04	-.19	-.13	.03	.18	-.04	-.14	-.05
Gender	.19	.24	-.16	.22	.05	.07	.06	.15
First- or Second-year Student[a]	.01	.19	.10	.15	.01	.04	.17	.11
Years of Certification[b]	-.12	-.05	-.02	-.15	.05	-.04	-.07	-.08
Undergraduate GPA	-.02	-.10	-.22	-.04	-.12	.00	-.08	-.10
Certification Status	-.08	-.18	-.05	-.13	-.07	-.05	-.09	-.13

Note: TS=Truth-seeking; OM=Openmindedness; A=Analyticity; S=Systematicity; SC=Self-confidence; I=Inquisitiveness; M=Maturity; [a]n=77 (two-year program students); [b]n=107 (certified athletic trainers)

The results for age revealed weak correlations for all CCTDI and associated subscales ranging from -.19 to .18. No subscale or overall CCTDI were statistical significant. Openmindedness and maturity revealed the highest negative correlation, whereas truth-seeking, systematicity, inquisitiveness, and total CCTDI have close to no relationship to age.

Gender correlations reveal weak coefficients ranging from -.16 to .24, and none of the subscales or overall CCTDI were statistical significant. Conversely, maturity, self-confidence, and inquisitiveness revealed close to no relationship with gender, whereas analyticity was the only subscale that recorded a negative relationship with gender. Total CCTDI has a weak relationship with gender.

The Relationship between Years of Certification, First- or Second-year Status, and Critical-thinking Disposition of Graduate Athletic-training Students

The third research question queries about the extent years of certification and first- or second-year graduate students are related to critical-thinking disposition as measured by the CCTDI and associated subscales. To address this third research question, point biserial correlation coefficients were computed for first- or second-year status and for years of certification with the CCTDI and associated subscales (Table 20).

The results of the current study reveal that truth-seeking, self-confidence, and inquisitiveness have little or no relationship to first- or second-year status as the coefficients range from .01 to .19. In addition, the openmindedness subscale had the strongest relationship but is weak, which may suggest a higher, on average, scores for second-year status than for first-year status. Total CCTDI score is weakly correlated suggesting little or no relationship to year in graduate program status. No subscales or overall CCTDI were statistical significant.

Only systematicity and truth-seeking had a weak negative relationship between years of certification and CCTDI total and associated subscales, with coefficients ranging from -15 to .05. Systematicity (-.15) and truth-seeking (-.12) had the strongest negative correlations, whereas all other subscales and overall CCTDI are close to no correlation, and none were statistical significant.

The Relationship between Undergraduate Grade Point Average, Number of Times Needed to Pass the Board of Certification Examination, Certification Status, and Critical-thinking Disposition of Graduate Athletic-training Students

The final research question investigated the extent of the relationship between undergraduate grade point average (GPA), number of times needed to pass the board of

certification (BOC) examination, and certification or noncertification status to critical-thinking disposition as measured by the CCTDI and associated subscales. To address this final research question, a table of point biserial correlation coefficients was constructed for certification status and undergraduate GPA (Table 20). In addition, correlation ratios were obtained for the number of times needed to pass the BOC examination and the CCTDI and associated subscales (Table 21).

Table 21

Correlation Ratio for CCTDI and Associated Subscales and Number of Times Needed to Pass the BOC Examination for 113 Postprofessional Graduate Athletic Training Students

Scale	Point Biserial for the Number of Times Needed to Pass BOC Examination
TS	.09
OM	.12
A	.21
S	.17
SC	.06
I	.06
M	.07
CCTDI Total	.17

Note: TS=Truth-seeking; OM=Openmindedness; A=Analyticity; S=Systematicity; SC=Self-confidence; I=Inquisitiveness; M=Maturity

Academic components investigated (undergraduate GPA and number of times needed to pass the BOC examination) in the current study revealed coefficients ranging between weak negative and weak positive for all CCTDI subscales and total CCTDI with inquisitiveness having no relationship with undergraduate GPA. Analyticity and self-confidence have a weak negative relationships with undergraduate GPA ranging from -.22 to .00 (Table 20), whereas analyticity, systematicity, and overall CCTDI revealed a weak relationship for number of times needed to pass the BOC examination ranging from .06 to .21. A closer inspection of the coefficient between the number of

times needed to pass the BOC examination and CCTDI total and associated subscales revealed mostly weak to no relationships. None of the subscales or overall CCTDI were statistically significant for undergraduate GPA and number of times needed to pass the BOC examination.

The relationship between certification status and CCTDI total and associated subscales is negative for all variables investigated because data were coded with noncertified having the highest value. CCTDI total, systematicity, and openmindedness all have a weak negative relationship, ranging from -.18 to -.05. Analyticity and inquisitiveness both have little or no relationship to certification status. None of the subscales or overall CCTDI were statistically significant.

Summary

This current study derived a critical-thinking disposition profile for graduate athletic training students. Every subscale revealed a positive disposition toward critical-thinking disposition with the exception of truth-seeking (*M*=37.94; *SD*=4.97) and openmindedness (*M*=39.58; *SD*=5.34), with inquisitiveness (*M*=44.35; *SD*=5.64) having the highest overall mean. Overall, a majority of graduate athletic training students had scores within the positive range as measured by the CCTDI (*M*=290.19; *SD*=27.69). The only subscale to achieve a moderate effect size was truth-seeking (.54) when compared with the Leaver-Dunn et al. (2002) study. In addition, the only variables to achieve a moderately negative effect sizes were self-confidence (-.60), inquisitiveness (-.51), and overall CCTDI (-.47) when compared with Racchini (2007). Additional variables investigated included age, gender, year in the graduate program, certification status, number of years certified, and number of attempts needed to pass the BOC examination

all revealed weak to no relationship with the CCTDI and associated subscales. No statistical significant was obtained for any variables examined.

CHAPTER V

SUMMARY, LIMITATIONS, DISCUSSION, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of this study was to measure critical-thinking dispositions of postprofessional graduate athletic-training students and to establish a critical-thinking disposition profile of graduate athletic-training students in accredited postprofessional graduate athletic-training programs using the California Critical Thinking Disposition Inventory (CCTDI). This profile was comprised of an overall CCTDI score and all seven subscales: truth-seeking, open-mindedness, analyticity, systematicity, critical-thinking self-confidence, inquisitiveness, and cognitive maturity. In addition, associated demographical data were obtained including age, gender, graduate program length (one or 2 years), first or second year in the 2-year program, certification status, number of years certified, number of times needed to pass the Board of Certification (BOC) examination, and undergraduate grade point average (GPA).This chapter contains the discussion related to each research question, implications, limitations, and recommendations for future research.

Summary

This current study derived a critical-thinking disposition profile for graduate athletic- training students. Every subscale revealed a positive disposition toward critical-thinking disposition with the exception of truth-seeking and openmindedness with inquisitiveness achieving the highest overall mean. Overall, a majority of graduate athletic-training students scored within the positive range as measured by the CCTDI. The only subscale to achieve a moderate effect size was truth-seeking when compared with the Leaver-Dunn, Harrelson, Martin, and Wyatt (2002) study. In addition, the only

variables to achieve a moderately negative effect sizes were openmindedness, systematicity, self-confidence, inquisitiveness, and overall CCTDI. Additional variables investigated included age, gender, year in the graduate program, certification status, number of years certified, and number of attempts needed to pass the BOC examination all revealed weak to no relationship with the CCTDI and associated subscales. No statistical significance was obtained for any variables examined.

Limitations

The only limitation expressed in the CCTDI test manual is controlling for socially desirable responses on the CCTDI. Socially desirable responses have the potential for the CCTDI to report higher scores than the participants true score would otherwise reflect. To decrease the prevalence of socially desirable responses, steps were taken to help alleviate this concern. Items on the inventory are not presented in any order, the names of the seven subscales are not revealed on the inventory, and the name of the inventory is only revealed by the initials – CCTDI.

Racchini (2007) pilot tested the paper-and-pencil version of the CCTDI on 20 certified athletic trainers at a national conference. Racchini reported that none of the 20 participants could identify what the CCTDI was attempting to measure. The researcher was confident that social desirability on the CCTDI was minimal.

Additionally, the atmosphere in which the CCDI and associated demographical data sheet was administered was not controlled by the researcher. Administration settings were not climate controlled. Because program directors administered the CCTDI and associated demographical data sheet, some program directors may have provided more

encouragement or motivation to perform well on the CCTDI, whereas other program directors may not have provided encouragement. Program directors were provided a script to use when administering the CCTDI at their university. Truthfulness on the demographic sheet was not controlled. Some participant's may have falsely stated information or inaccurately recalled undergraduate GPA or the number of times needed to pass the BOC examination.

Although the CCTDI is reported to be reliable, the current study was limited to the reliability of the testing instrument. Additionally, the generalizability of the current study is limited to graduate athletic-training students in the programs who participated because there is no way to assess the representativeness of respondents to students in all of the athletic training programs in the US at the time of the study. In addition, the National Athletic Training Association tracks whether or not undergraduate athletic-training students continue his or her education and gender but additional information such as age, undergraduate GPA or other vital statistics are not tracked.

Finally, the lack of variability in responses to years of certification, certification status, undergraduate GPA, and age variables resulted in the combining of response categories. There may not be sufficient variation in the previously identified variables for an accurate assessment of the relationship between these results on the CCTDI. In addition, out of the 16 possible graduate programs solicited for the current study only 11 agreed to participate. Out of the 11 postprofessional graduate programs agreeing to participate, only 7 returned the CCTDI and demographic sheet for analysis and inclusion in the current study.

Discussion

The following section contains a discussion of each research question where the results for the current study are compared with results of previous studies referenced in the literature review. Following the discussion of each research question, implications of the results are discussed and recommendations for future research are presented.

Critical-thinking Disposition Profile for Graduate Athletic-training Students

What are the profiles of critical-thinking disposition among postprofessional graduate student athletic trainers and how do they compare with undergraduate athletic-training and certified athletic trainers for CCTDI and associated subscales was the first research question stated. The first research question resulted in the creation of a critical-thinking disposition profile for graduate athletic-training students. The results revealed that a majority of students' CCTDI means are within the positive disposition range as measured by the CCTDI; however, a greater percentage of graduate athletic-training students had subscale scores lower than the percentage suggested in the CCTDI testing manual (Table 22). In addition, no graduate athletic-training students attained a score above 50 suggesting that a majority of students do not consistently apply critical-thinking disposition when confronted with difficult situations (CCTDI test manual, 2010). Conversely, few students had scores below 40, with the truth-seeking subscale revealing the highest percentage of participants in opposition (5.3%) suggesting that a majority of graduate athletic-training students use critical thinking disposition when making clinical decisions.

Table 22

CCTDI Test Manual Suggested Percentages of Graduate Students Scoring Below 40 on the CCTDI and Associated Subscales Compared with the Percentages for the Current Study

Scale	Current Study (*n*=113)	CCTDI Test Manual
TS	64.6	26
OM	63.8	9
A	29.2	15
S	37.1	26
SC	46.9	6
I	26.5	1
M	35.4	12

Note: TS=Truth-seeking; OM=Openmindedness; A=Analyticity; S=Systematicity; SC=Self-confidence; I=Inquisitiveness; M=Maturity

Although, a majority of graduate students demonstrated an overall positive critical-thinking disposition, the means for truth-seeking and openmindedness subscales are within the ambivalent range. These results suggest that graduate athletic-training students, on average, demonstrate a proclivity toward not seeking the best possible answer or answers that differ from his or her own person bias and an unwillingness to be open to listening to other individuals' viewpoints and beliefs that differ from his or her own. Students who score lower in truth-seeking and openmindedness may miss clinical signs or symptoms during an evaluation or through input from colleagues that may have deleterious consequences in treatment and outcome.

Athletic trainers who are identified as ambivalent by the CCTDI and who do not seek the truth or a deeper understanding of the clinical implications of his or her decisions if they become instructors or clinical supervisors then this cycle would be propagated with students. The ultimate outcome of not correcting closedminded thought

and only seeking a superficial understanding of clinical implications of decisions is a move away from evidence-based medicine and reflection of clinical judgment.

The ambivalent range scores found for the truth-seeking subscale in the current study may be attributed to the passive style of teaching not only in graduate athletic training education but also in education in general (Facione & Facione, 1997; Radke, 2008). Leaver-Dunn et al. (2002) suggested that undergraduate athletic training curriculum is more concerned with presenting students with rote memorization of information rather than developing a deeper understanding of why the information is important. If rote memorization is the primary means of instruction in undergraduate, then there is no reason to suggest this trend would change as one progresses through his or her professional career as was observed by Racchini (2007) with certified athletic trainers.

The openmindedness subscale mean for graduate athletic-training students, on average, were lower than means previously reported for graduate nursing (Facione & Facione, 1997). Undergraduate athletic-training students and certified athletic trainers had higher means than graduate athletic-training students participating in the current study. When compared with various studies investigating CCTDI results in related healthcare fields, these results suggest that graduate athletic-training students may be less likely to accept or listen to views or opinions that may differ from his or her own. Again, the findings of the current study may be a result of the teaching style or environment graduate students experience in his or her undergraduate studies (Radke, 2008). If undergraduate athletic-training students are not encouraged to exchange ideas or respect

other's opinions, then this mentality may be pervasive as one progresses through his or her graduate studies (Leaver-Dunn et al., 2002).

The remaining subscales, analyticity, systematicity, self-confidence, inquisitiveness, and maturity, all revealed lower means than previously reported for graduate nursing students and certified athletic trainers (Facione & Facione, 1997; Racchini, 2007). Although the results of the current study are lower than other studies investigating graduate students, the overall results are in the positive range as identified by the CCTDI testing manual. These results suggest that, as a whole group, graduate athletic-training students tend to demonstrate organization skills and a systematic thought process when confronted with problems or clinical decisions (systematicity), trust his or her reflective thought and reasoning abilities to solve problems and make clinical decisions (self-confidence), possess an intellectual curiosity and drive to acquire new information even if that information is not needed at the current time (inquisitiveness), and are able to make decisions in a timely manner rather than rushing to make a judgment (maturity).

One trend that emerges from the current study is that undergraduate athletic-training students (Leaver-Dunn et al., 2002) have higher overall CCTDI mean than their graduate counterparts. Although the difference was small, the relatively short period of time occurring between undergraduate and graduate studies may not be sufficient to observe higher scores as was found for nursing students (Facione & Facione, 1997). In addition, Facione and Facione suggested that CCTDI scores should increase as one gains experience and as one ages, and because a majority of undergraduate students go

immediately to a graduate athletic training program from an undergraduate athletic training program (Graman, 2007), there may not be sufficient time to expect a change.

CCTDI results for nursing students had the greatest difference in means for the total CCTDI and associated subscales compared with the graduate athletic-training sample. Although one may attribute this large difference in means on the total CCTDI and subscales to the commitment to critical thinking as measured by nursing program outcomes (National League for Nursing, 2008), the National Athletic Training Association professional education committee identifies critical thinking as an outcome of postprofessional graduate athletic-training education as well. One possibility for the difference between CCTDI scores for graduate nursing students and graduate athletic-training students may be attributed to the fact that the National League of Nursing has identified and made a commitment to providing nurse educators with opportunities to become better instructors by increasing research in the area of nursing education and support for nurses who wish to become educators (National League of Nursing Position Statement, 2002).

The results of this profile suggest that, on average, the graduate athletic-training students who participated in the current study have a strong affinity to seek knowledge and information (inquisitiveness), foresee problems that can arise from his or her decisions (analyticity), and approach problems as complex rather than simple with the goal of making clinical judgments in a timely manner (maturity). Conversely, on average, graduate athletic-training students may be reluctant to seek relevant evidence to make better clinical decisions (truth-seeking) and be open to listening to other opinions that may be different from his or her own (openmindedness).

Relationship between Age and Gender and Critical-thinking Disposition

The second research questions stated to what extent are age and gender related to critical-thinking disposition among postprofessional graduate-student athletic trainers as measured by the CCTDI and associated subscales. The results revealed that overall age and gender have either weak or no relationship to the CCTDI and associated subscales. It should be noted that 97% (*n*=110) of participants in the current study are between the age of 21 to 30 years of age resulting in little variation.

Previous research investigating the relationship between age of certified athletic trainers and of undergraduate athletic trainers and results on the CCTDI revealed no to little relationship (Leaver-Dunn et al., 2002; Racchini, 2007).Various studies that have used a majority of participants over the age of 30 have attained opposite results compared with the current study (Leppa, 1997; Yeh & Chen, 2003). Studies investigating the relationship between age and critical-thinking disposition have yielded stronger results if the participants are older (>30) as compared with younger participants (Facione & Facione, 1997; Hicks et al., 2003; Leppa; Yeh & Chen). These results would suggest that age appears to be a factor in critical-thinking disposition, and as one ages, the results on the CCTDI increase as a result of normal cognitive development (Yeh & Chen). This assumption is further reinforced in the field of athletic training. Racchini found that older athletic trainers demonstrated a higher CCTDI mean and subscale means over their younger counterparts. Overall, the CCTDI may not be sensitive sufficiently to capture statistically significant changes until a certain age, increased job experience, or level of cognitive development is achieved.

Gender, like age, did not reveal a statistically significant relationship with the CCTDI or associated subscales. These results are similar to results obtained by Facione and Facione (1997) with nursing students, Leaver-Dunn et al. (2002) with undergraduate athletic-training students, and Racchini (2007) with certified athletic trainers. Researchers that found differences in CCTDI and associated subscales posited that the differences may simply be an artifact of the sample or other factors not accounted for in their studies (Giancarlo & Facione, 2001; Giddens & Gloeckner, 1999). There remains considerable ambiguity related to gender differences on the CCTDI, or the CCTDI testing instrument may not be sensitive enough to detect changes between males and females if they exist.

Relationship between Years of Certification, First- or Second-year Status, and Critical-thinking Disposition

The third research question queries about the extent years of certification and first- or second-year graduate athletic-training students are related to critical-thinking disposition as measured by the CCTDI and associated subscales. The results of the current study suggest that the year a graduate athletic training student is in his or her program is not related to CCTDI or associated subscales. Some CCTDI subscale variables, openmindedness, systematicity, analyticity, maturity, and overall CCTDI have a weak correlation but were not statistically significant. These results may be an artifact of the study, and at best, accounting for between 1% and 4% of the variation in test scores.

These results are similar to those obtained by Leaver-Dunn et al. (2002) with undergraduate athletic-training students. Leaver-Dunn et al. found no correlation between year in the undergraduate athletic training program and the CCTDI or associated

subscales. Studies utilizing a longitudinal method rather than a cross-sectional method have found statistically significant results or a nonsignificant but positive increase from entry to exit of the respective program (Facione & Facione, 1997; Leppa, 1997; Miller, 2003; Phillips et al., 2004).

In the current study, there is no relationship between years of certification and results on the CCTDI and associated subscales. These results were consistent with undergraduate athletic-training students (Leaver-Dunn, 2002) and certified athletic trainers (Racchini, 2007). A majority of the participants in the current study have been certified for less than 2 years. Certified athletic trainers with less than 6 years of experience had a mean of less than 40 on the truth-seeking subscale (Racchini) but not on the openmindedness subscale as in the current study. It was not until certified athletic trainers with greater than 20 years of experience that they had an overall mean greater than 40 on the truth-seeking subscale suggesting that there may be a natural increase in critical-thinking disposition associated with cognitive development and clinical experience. A possible explanation as to why graduate athletic-training students did not have openmindedness means in the positive range may be just an artifact of the sample compared with their undergraduate and certified athletic trainer counterparts.

Although no relationship was found in the current study between years of certification and the CCTDI, previous research has suggested clinical experience is related to self-perceived increases in critical thinking and more consistent decision-making processes in respiratory therapists (Goodfellow, 2001) and critical-care nursing (Hicks, Merritt, & Elstein, 2003). A relationship between critical-thinking disposition and years of certification may not have been obtained because a majority of the participants in

the current study had been certified less than 2 years. The participants in Hicks et al.'s study were critical-care nurses with a mean of 9 years of experience, whereas the participants in the Goodfellow study were practicing respiratory therapists a mean of 15 years of experience. Leaver-Dunn et al. (2002) suggested that differences in their findings compared with other professions related to a quality of clinical experience hours verses a quantity of clinical experience hours, meaning that the greater number of clinical hours obtained does not necessarily equate to an improvement in critical-thinking abilities. Because graduate athletic-training demands many hours, the quality of hours verses the quantity of hours may be a factor in the lack of statistical significant findings for the current study.

Relationship between Undergraduate GPA, the Number of Times Needed to Pass the Board of Certification Examination, Certification Status, and Critical-thinking Disposition

The final research question investigated the extent of the relationship between undergraduate grade point average (GPA), number of times needed to pass the board of certification (BOC) examination, and certification or noncertification status with critical-thinking disposition as measured by the CCTDI and associated subscales. A majority of the results yielded little to no relationship with undergraduate GPA, number of times needed to pass the BOC, and certification or noncertification status.

Leaver-Dunn et al. (2002) found no correlation between undergraduate GPA and overall CCTDI and associated subscales, whereas Racchini (2007) found analyticity, systematicity, cognitive maturity, and overall CCTDI resulted in statistically significant relationship. In the current study, analyticity (r=-.22) resulted in the strongest relationship with undergraduate GPA but accounted for less than 5% of the variation in scores.

Previous studies investigating undergraduate GPA and the CCTDI have resulted in ambivalent results. Facione and Facione (1997) and Thompson and Rebeschi (1999) found no relationship between GPA and the CCTDI with undergraduate nursing students, whereas Stewert and Dempsey (2005), Giancarlo and Facione (2001), and Ip et al. (2000) found statistically significant relationships between undergraduate GPA and CCTDI and the various subscales.

Similarly, an overall weak correlation existed between the number of times needed to pass the BOC examination and the overall CCTDI and associated subscales. In the only other study in the field of athletic training investigating BOC pass rates, Racchini (2007) found that certified athletic trainers who passed the BOC examination on the first attempt had the highest means for truth-seeking, openmindedness, analyticity, inquisitiveness, maturity, and overall CCTDI; however, the only subscale to achieve statistical significance was maturity. Racchini concluded that the number of times needed to pass the BOC examination did not affect critical-thinking disposition.

In the field of nursing, only Giddens and Gloekner's (2005) study investigating the registered nurse national certification licensing examination (RN-NCLEX) had results that indicated that, on average, students who passed the RN-NCLEX had statistically significantly higher means on the overall CCTDI and truth-seeking, openmindedness, systematicity, and maturity scales. In the current study, overall CCTDI, openmindedness, systematicity, and analyticity were the only subscales to achieve a weak correlation with the number of times needed to pass the BOC examination, but no statistical significance was obtained. The results suggest that, if a correlation exists between the number of times needed to pass the BOC examination and the CCTDI, it is tenuous at best.

The final variable investigated, certification status, resulted in little to no relationship with total CCTDI and associated subscales. The results of the aggregate data set by Facione and Facione (1997) revealed that students who enter a program with or without a registered nurse (RN) license had an overall mean greater than 280 as demonstrated in the current study. This cutoff range suggests a positive disposition in overall critical-thinking disposition; however, students with RN license at entry had a higher overall CCTDI mean than those students without RN license upon entry. Facione and Facione suggested that the differences in the overall CCTDI and the subscales upon entry could be attributed to the fact that the mean age of the RN licensed sample was 33.58, whereas the mean age of the non-RN sample was 25.28. Similarly, Shin, Jung, Shin, and Kim (2006) found that licensed RNs score higher, on average, on the CCTDI than their non-RN licensed counterparts upon entry into a nursing program; however, cultural and instructional differences have been suggested as confounding factors for their results. Shin et al. specifically identified the differences between Far Eastern students and North American students for lower CCTDI scores regardless of licensing status. Greater results on the CCTDI may not have been obtained in the current study because of the relatively young and inexperienced sample.

Implications for Practice

Developing a critical-thinking disposition profile for graduate athletic-training students can provide insight into the process by which a graduate athletic-training student approaches problems between clinical situations and makes clinical decisions. Athletic training, like many other healthcare professions, continuously evolves to meet the demands of an ever changing society. Investigating the means by which other healthcare

fields such as nursing, occupational therapy, and pharmacology evaluate critical thinking can provide insight and direction for improving education in the field of athletic training. In addition, comparing results of undergraduate athletic training and certified or practicing athletic trainers can provide insight into graduate athletic training education in developing critical-thinking dispositions because almost half of undergraduate athletic trainers pursue graduate degrees in disciplines other than athletic training (Graman, 2007).

The goal of the graduate athletic training education programs is to further advance knowledge attained in undergraduate education through classroom and clinical experiences, which is no different than other healthcare professions. The subscales of truth-seeking and openmindedness resulted in an overall ambivalence suggesting that greater emphasis on teacher-student interaction, student-student interaction, and instructor facilitated and supervised clinical experiences be utilized to develop these two aspects of critical-thinking disposition.

Truth-seeking can be enhanced by encouraging students to question personal biases and opinions that differ from others can facilitate learning while enhancing interaction skills necessary for an athletic trainer's daily interaction with other healthcare professions. In addition, reflection and discussion on clinical, as well as classroom experiences, will improve the learning environment and better develop critical-thinking disposition as identified on the CCTDI subscales. Self-examination on the part of the instructor, challenging prior biases that may differ from presented information or the opinions of other, assisting students in the decision-making process, have all been suggested by Leaver-Dunn et al. (2002) as strategies to encourage truth-seeking. In

addition, journals and simulation can encourage students to draw on previous experiences for the application in current situation (Leaver-Dunn; Radke, 2008). High fidelity simulations may provide a resource for instructors to facilitate truth-seeking by placing students in authentic clinical situations requiring them to seek a deeper understanding of clinical situations (Lasater, 2007). In addition, simulations allow students to seek peer feedback in a controlled clinical environment (Lasater).

Radke (2008) suggested that higher education in graduate athletic training is primarily about transferring knowledge from classroom to clinical experiences. Radke inferred that the transferring of the knowledge attained in the classroom is only as good as the learner's ability to adapt to changing clinical situations or environments. The development of openmindedness, or the ability to listen to others, greatly affects patient care in a pluralistic society. Reflecting upon student's experiences, promoting dialogue and inquiring about actions taken, and receiving feedback can promote openmindedness in athletic trainers. Placing students in situations where he or she must reflect on clinical decisions, he or she must explain his or her actions to peers as well as instructors, and alternate outcomes or scenarios presented by the instructor are ways students may improve on his or her truth-seeking and openmindedness abilities.

The implementation of technological resources may enhance the interaction between instructors and students as well as between students that can encourage truth-seeking, openmindedness, and sharing clinical experiences. Blogs can be utilized to share case studies and promote learning through first-hand experiences. In addition, discussion boards can be utilized to promote deliberations between peers and instructors about

current issues that challenge existing practice standards or present new and innovative clinical methods.

Recommendations for Future Research

Knight (2008) has suggested that graduate athletic-training education advances knowledge obtained from undergraduate education, so assessing whether or not this advancement is occurring can provide further support for continued education in the field of athletic training. Assessing differences in critical thinking development between athletic trainers who pursue advanced degrees in athletic training and those who pursue advanced degrees in related fields such as education or exercise science should be investigated. Because almost 50% of graduating undergraduate athletic-training students attend graduate school in an area outside of athletic training, the need to promote graduate education in athletic training can affect the future of the profession (Graman, 2007).

If improved critical-thinking disposition will lead to better clinical reasoning, which in turn will lead to sound clinical judgment, should improving critical-thinking disposition be a goal of an advanced athletic training degree? Providing instructors and students with the tools to improve critical-thinking abilities are only one aspect. A means of assessing whether or not this improvement is being accomplished is necessary to advance the development of critical-thinking abilities. Lasater (2007) suggested that healthcare professionals must possess high-level decision-making skills (clinical judgment) to manage ill-defined clinical situations. The ultimate goal of graduate athletic training education is to produce effective and qualified practitioners through developing critical-thinking abilities.

If the field of athletic training has identified critical-thinking abilities as an important aspect of undergraduate and graduate education, then the means for assessing development in athletic-training students should be implemented. Evaluating change in critical thinking over the course of someone's matriculation in graduate athletic-training education can be accomplished through a longitudinal assessment using the CCTDI and has demonstrated increases in overall CCTDI and certain subscales (Facione & Facione, 1997; Giancarlo & Facione, 2001; Leppa, 1997; McCarthy, Schuster, Zehr, & McDougal, 1999; Thompson & Rebeschi, 1999). In addition, tracking a student's critical-thinking development from undergraduate through graduate school may provide insight into instruction practices by which certain programs succeed at developing critical-thinking disposition.

In the field of athletic training, studies typically measured professional competency by certification pass rates (Turocy, 2002). Although these high-stakes tests measure theoretical knowledge, they do not provide any insight into one's ability to apply that knowledge in more authentic clinical situations (Racchini, 2007). In other fields such as nursing, it has been asserted that critical-thinking disposition is necessary to pass exams like the National Council Licensure Examination for Registered Nurses (NCLEX-RN; Wendt & Brown, 2000). This assertion has been supported by studies suggesting that critical-thinking dispositions are correlated with passing the NCLEX-RN (Facione & Facione, 1997; Giddens & Gloeckner, 2005; Hall, 1996). Although no statistical significance was obtained in the current study, Colt (2007) found a statistically significant relationship between critical-thinking skills and passing rates on the BOC examination, but Colt still encountered the same limitations as in the current study of

self-reported examination results. Future research should investigate whether or not a relationship exists between BOC pass rates and critical-thinking disposition on a larger sample size for undergraduate students or graduate students. Because only about half of undergraduate students attend graduate school after graduating from an undergraduate program, but all students will take the BOC examination upon graduating, these data may provide insight into the development of critical-thinking abilities for students who choose to pursue a graduate degree and those who choose to enter the workforce. In addition, CCTDI results may be obtained when entering an undergraduate program and again upon completion of a graduate program so a more longitudinal assessment made about the development of critical-thinking disposition.

Finally, because the CCTDI is a static discipline-neutral instrument used to assess critical-thinking disposition, utilization of a discipline-specific instrument for assessing critical-thinking abilities may elicit more meaningful results. Developing or utilizing an instrument that provides instant feedback, such as assessment with simulations or under more controlled medically-specific environments may be more advantageous for students and instructors. Because patient outcome or results in the form of improving clinical judgment is the ultimate goal of athletic training education, assessment using instant and specific feedback regarding processes used by students in his or her decision-making should be the focus of the learning environment.

Summary

Athletic trainers are the first responders for emergency care for athletes. Because athletic trainers are considered first responders for emergency care, they are in a unique

position of expediting care, mitigating the impact of an injury, or intervening in the outcome of a severe or life-threatening injury.

In 2005-2006, the Center for Research Injury and Policy conducted a national study investigating injury frequency, types, body part affected, and severity of injuries, and various demographics such as when an injury occurred and the mechanism of the injury (Yard & Comstock, 2008). These results suggested that an estimated 1.4 million injuries are sustained by secondary-school athletes every year. Of these injuries, it is estimated that approximately 400,000 of the injuries sustained by secondary-school athletes are concussions (Yard & Comstock, 2009). In addition, since 1994 approximately 1,260 athletes under the age of 39 died because of a heart-related incident while participating in an athletic event (Maron et al., 2009). The 2009 annual survey of catastrophic football injuries recommends that every institution employ a full-time certified athletic trainer to assist in preventing and providing immediate care for traumatic sports-related injuries (Mueller & Cantu, 2009). Because of the potential for catastrophic injuries in sports, there is an equal need for competent individuals who possess the necessary abilities to apply critical thinking and exercise sound clinical judgment to ensure the best possible care in emergency situations.

With participation of sports on the rise in the US, appropriate medical care needs to be available to prevent and mitigate the severity of potentially life-threatening injuries (Anderson, Courson, Kleiner, & McLoda, 2002). Athletic training is no different than other healthcare fields wherein sound clinical judgment is paramount to performing everyday duties and failure to exercise sound clinical judgment can lead to catastrophic consequences (Colt, 2007).

Currently in the field of athletic training critical-thinking abilities is identified as an important outcome of undergraduate and graduate education. Unfortunately, assessing whether or not critical thinking is being taught, developed, and nurtured has been challenging. BOC pass rates have been the benchmark used to assess an individual's or an institution's success at developing critical-thinking abilities, but a majority of graduate athletic-training students already passed the BOC examination prior to entering a postprofessional graduate athletic-training program making this means of assessing critical thinking a moot point. In addition, assessing critical-thinking abilities by using a traditional paper-and-pencil tool may not elucidate whether or not critical thinking is being developed in authentic situations. The development of assessment tools that use authentic or simulated environments may provide a clearer picture of how best to develop critical thinking in graduate athletic-training students.

Educators of athletic trainers as well as athletic trainers themselves need to become more aware of the development, promotion, and utilization of critical-thinking abilities. As participation in youth sports increase so does the incident of potentially life-threatening injuries. The need to develop critical-thinking disposition and related abilities can affect directly the quality of emergency care and the outcome of treatment and care.

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Appendixes

Appendix A

Participant Consent Letter

Dear Participant,

My name is Jon Cohen, and I am a doctoral student in the School of Education at the University of San Francisco. I am doing a study on critical-thinking disposition among post-professional graduate athletic-training students. I am interested in assessing whether or not one aspect of critical thinking is being developed, nurtured, or fostered from an undergraduate education through a graduate education at an NATA approved program.

Participation in this study is voluntary and anonymous. Your decision to participate or not participate will not affect your status in the graduate program. You will only identify yourself by your student identification number if you wish to receive your scores on the instrument along with an interpretation of those scores at the completion of the study. I will not have access to names associated with student identification numbers; therefore, your responses are anonymous to me. Only summary data will be reported to your university and will be used in my dissertation research. For those of you requesting your individual results, I will return your results in a sealed envelope with your student identification number written on the envelope to your program director, who will distribute them to you so that only you will have access to those individual results. The data will be stored in a secure location accessible only by me.

If you choose to participate, please complete the demographic questionnaire and the CCTDI. It should take you about 15 to 20 minutes to complete both instruments. If you do not wish to participate, there is a reading for you on critical thinking in graduate education. At the end of 20 minutes, all questionnaires will be collected, and the reading is yours to keep.

If you have further questions about the study you may call or e-mail me. Approval for this study has been obtained by the Institutional Review Board for the Protection of Human Subjects (IRBPHS) at the University of San Francisco. If you have questions or comments about this study, first contact me at [redacted]. If for some reason you do not wish to do so, you may contact the IRBPHS, which is concerned with the protection of volunteers in research studies. You may reach the IRBPHS office by calling (415) 422-6091 or by writing to the IRBPHS, School of Education Building, University of San Francisco, 2130 Fulton Street, San Francisco, CA 94117-1080.

Thank you for your interest in and contribution to my research on critical-thinking disposition development in your graduate studies.

Sincerely,

Jon Cohen MS, ATC, CSCS

Appendix B

Participant Demographic Survey

Participant Demographic Sheet

Student ID # _____

Gender:: ☐ Male ☐ Female

Age: ☐ 21-30 ☐ 31-40 ☐ >40

Is your program a one-year program? ☐ Yes ☐ No

If your program is a two-year program, you are in your: ☐ 1st year ☐ 2nd year ☐ N/A

Certification status: ☐ certified ☐ noncertified

If certified, number of times needed to pass the BOC examination:

☐ 1 time ☐ 2 times ☐ 3 or more

If certified, number of years certified:

☐ 0-2 years ☐ 3-5 years ☐ 6-10 years ☐ >10 years

Undergraduate grade point average

☐ 2.00-2.50 ☐ 2.51-3.00 ☐ 3.01-3.50 ☐ 3.51-4.0 or greater

Appendix C

Initial Contact Letter to Program Directors

Dear Program Director,

My name is Jon Cohen and I am a doctoral student at the University of San Francisco in the School of Education and a certified athletic trainer. I am conducting a study for completion of my dissertation in the area of critical-thinking disposition among post-professional graduate athletic-training students. Dr. Leamor Kahanov, the Athletic Training Department Chair at Indiana State University, is supporting me in conducting the study to complete my dissertation. Dr. Kahanov believes that this research may lead to assisting other graduate program directors in assessing whether or not graduate students are continuing to develop critical thinking beyond the undergraduate education.

It is believed that a graduate education from an accredited post-professional program in athletic training should continue to develop, foster, and nurture critical thinking from an undergraduate education. Participation in this investigation will assist researchers in assessing if post-professional programs are accomplishing the goal of continuing to develop one aspect of critical thinking. The results of the study can assist program directors in assessing if one aspect of critical thinking, critical-thinking disposition, is being developed in post-professional graduate athletic training education programs.

This letter is to request the participation of your post-professional graduate athletic-training program in this research investigation. The purpose of this investigation is to assess critical-thinking disposition of first- and second-year graduate athletic-training students. Critical-thinking disposition will be assessed by administering the California Critical Thinking Disposition Inventory (CCTDI) and a demographic sheet to first- and second-year graduate athletic training students.

As my contact for this research, I would ask your assistance in administering the CCTDI and demographic survey to all first- and second-year graduate athletic training students in a group setting around the beginning of the Spring 2010 semester. The administration of the inventory and survey will take no longer than 20 minutes and will be sent back to me for scoring and analysis. Once the analysis is completed, the results will be made available to you and your program. Anonymity of the participants will be maintained as no one will supply names on the questionnaires. For those students requesting results of their CCDTDI, I will ask them to write their identification number on the CCDTI. An individual participant's results will be returned to you along with an explanation in a sealed envelope with the participants' student identification number on the outside of the envelope for you to distribute.

Your participation in this research investigation would be greatly appreciated. The results of the survey can assist you in evaluating if your students are developing one aspect of critical thinking in your graduate programs. If you have questions or comments about this study, first contact me at [redacted]. If for some reason you do not wish to do so, you may contact the IRBPHS, which is concerned with the protection of volunteers in research studies. You may reach the IRBPHS office by calling (415) 422-6091 or by writing to the IRBPHS, School of Education Building, University of San Francisco, 2130 Fulton Street, San Francisco, CA 94117-1080.

Please review the attached consent letter, fill-in your institution's information, and sign your consent for participation. You may attach a signed copy of the consent and return it back to me either by e-mail or fax [redacted]). In your reply, please identify

the number of potential participants in their first and second years of post-professional graduate athletic training education.

Thank you, for your time,

Jon Cohen, MS, ATC, CSCS
NATA Certification #
University of San Francisco
2130 Fulton Street
San Francisco, CA 94117-1080

Appendix D

Instructions for Administering CCTDI Inventory and Survey

Test administration procedures

Before starting the California Critical-Thinking Inventory and Demographic survey

1. The envelope you have received contains the CCTDI testing manual, the CCTDI, demographic survey, and copies of an article on critical thinking in graduate education. Test administrators should familiarize themselves with the general instructions found on page 16 of the testing manual. These instructions include:

- Make sure the testing environment is well lit and comfortable

- Make sure test takers have #2 pencils

- Make sure test takers darken the bubbles completely and correctly

2. After all students are seated please distribute the student participation letter.

3. After all students have read the letter please provide the following explanation:

- Explain to the students that participation is optional and will not affect his or her status in the graduate program.

- Additionally, explain that the student's identification number is required only if he or she wishes to receive his or her results. If the student does not wish to participate, he or she may read the article on critical thinking in graduate education. Regardless if he or she chooses to participate or not he or she may keep the article.

- The total time to complete the study will be about 15 to 20 minutes.

4. The proctor should now distribute the demographic survey, the CCTDI, and the article on critical thinking in graduate education.

5. Those students wishing to receive their results in a sealed envelope should continue by filling in his or her student identification number on the demographic sheet and along the top of the CCTDI answer sheet provided. The participant should not write his or her name on the answer sheet. Students not wishing to participate may read the critical-thinking article.

6. The proctor will then read aloud the two examples inside the front cover of the CCTDI and direct the persons to be tested to the answer sheet to see how the example responses are marked.

7. The proctor will then read aloud directions 8 through 15 from the CCTDI test manual (located on page 16) to all participants.

8. Upon completion of the CCTDI and demographic survey, test administrators will collect all testing materials, scoring sheets, and demographic sheets from the participants regardless of whether the student has completed the instrument or not. All of the collected items should be placed in the return envelope provided and placed in the mail.

Appendix E

Support Letter from Dr. Leamor Kahanov

October 29, 2009

Leamor Kahanov, EdD, ATC
Chair, Athletic Training Department
Indiana State University
Arena C-06
Terre Haute, IN 47803

Dear Members of the Committee:

I am writing to inform you that I am aware of the research proposed by Mr. Jon Cohen, a doctoral student at USF and am in full support of his research. Furthermore, I am giving written permission for Mr. Jon Cohen to use my name on the initial contact letter that will be sent to all post-professional graduate athletic-training program directors.

If you have any questions or concerns, please feel free to contact me at (812) 237-4554.

Sincerely,

Leamor Kahanov