CLINICAL REASONING PERCEPTIONS AND SELF-EFFICACY OF STUDENTS IN A PATIENT-CENTERED POST-PROFESSIONAL DEGREE PROGRAM: A DISSERTATION OF CLINICAL PRACTICE IMPROVEMENT

A Dissertation

Presented in Partial Fulfillment of the Requirements for the

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with a

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by

Lindsay Warren

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Major Professor: Russell T. Baker, DAT

Authorization to Submit Dissertation

This dissertation of Lindsay Warren, submitted for the degree of Doctor of Athletic Training with a Major in Athletic Training and titled "Clinical Reasoning Perceptions and Self-Efficacy of Students in a Patient-Centered Post-Professional Degree Program: A Dissertation of Clinical Practice Improvement" has been reviewed in final form. Permission, as indicated by the signatures and dates given below, is now granted to submit final copies to the College of Graduate Studies for approval.

Major Professor: _____Date_____
Russell T. Baker, DAT

Committee Members: _____Date_____
Alan M. Nasypany, EdD

_____Date_____
Nicole J. MacDonald, DrPH

_____Date_____
Tim Speicher, PhD

Chair, Movement Sciences: _____Date_____
Philip W. Scruggs, PhD

Dean, College of Education: _____Date_____
Corinne Mantle-Bromley, PhD

Final Approval and Acceptance

Dean of the College
of Graduate Studies: _____Date_____
Jie Chen, PhD

Abstract

A dissertation of clinical practice improvement (DoCPI) is a comprehensive document that will signify the evolution of a scholarly practitioner and progress toward advanced practice. The DoCPI will include a Plan of Advanced Practice (PoAP), which is indicative of critical reflection and professional development. The PoAP will detail patient care, teaching, and research philosophies, as well as a measurable plan for attaining advanced practice in chosen areas of focus. The DoCPI will also include a summary and analysis of clinical outcomes and residency findings, illustrating a transformation of clinical practice, development of decision-making, and advancement of clinical skill and aptitude. A literature review of clinical reasoning in the health professions will represent foundational knowledge of a focus area. Finally, research products will provide evidence of development as a scholar.

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Dedication

I would like to dedicate this document, and all of the work that it represents, to my parents for their unending love and support, and my sisters for sharing with me a passion for life and incessant thirst for knowledge. I hope to make you proud.

Table of Contents

List of Charts

List of Tables

List of Figures

Chapter 1

Narrative Summary

One purpose of the Doctor of Athletic Training (DAT) program is to provide athletic training (AT) professionals with an opportunity to receive formal training and mentorship towards advanced practice. The degree is unique from traditional doctoral degrees in AT because it is focused in professional practice. The DAT curriculum includes both practical emphasis and theoretical emphasis, and is designed to prepare an athletic trainer as a researcher and advanced practitioner. In the program, students develop academically, while maintaining a clinical focus; creating relevant knowledge to advance their patient care, as well as contribute to the body of health care literature. The requirements of the program include: mentored clinical practice, purposeful and regular written reflection, identified advanced practice focus areas, and research products, including a dissertation, that should be disseminated to the profession.

To become an advanced practitioner, one must first identify the characteristics necessary to reach advanced practice. In the context of AT and emphasized in the DAT, advanced practice may include action research (AR) minded reflective practice, clinical skill and aptitude, commitment to continued learning, professional responsibility, focus or specialty areas, and scholarly practices (Knight and Ingersoll, 1998; University of Idaho, 2011). Combined success in each of these areas provides the foundational support for advanced practice.

Action research is essentially a problem solving process to develop well-informed action. Action research begins with awareness and exploration of a problem

within a specific context. The problem can be of the self, the environment or team, or the greater society (Koshy, Koshy, and Waterman, 2010). No matter the problem, there is stakeholder motivation for change. Reflection on the problem is performed, and a plan to address the problem and measure any change is established. The plan for change is put into action, the results of the change are analyzed, and necessary adjustments are determined through reflection. The AR cycle repeats as many times as necessary. The practitioner, with a deepening understanding of the problem, continues to identify issues and thoughtfully responds. (Koshy et. al., 2010).

The strength of AR is in its purpose to generate meaningful solutions to practical problems and, in doing so, empowers practitioners to become researchers in their context (Meyer, 2000). Action research is participatory in nature as researchers become participants themselves, working together with patients and the community to shape and design solutions (Koch, Kralik, 2006). In clinical practice, AR allows athletic trainers to remain in their natural role as clinician to produce practical knowledge and create new forms of understanding. Clinical practice is more complex and presents more realities than can be captured by theory alone. Action research promotes the testing of theory in real life clinical practice, creation of practice-based evidence, in the pursuit of better patient care and ultimately, best practice (Meyer, 2000).

Theory without action is meaningless, just as action without reflection and understanding is empty (Reason, Bradbury, 2001). Clinicians who research their clinical context may reduce gaps between theory and practice by analyzing and critically reflecting upon the implementation of theories in practice. Not only does scholarship within a clinician's practice enhance the information available to the

profession, it promotes development of the clinician's clinical reasoning, enhances decision-making, and changes the clinician's practice (Wilding, Curtin, and Whiteford, 2012).

Critical reflection within the DAT requires clinicians to test assumptions and prior knowledge, explore new evidence, ask questions, and generate new ideas. In AT, reflection is a critical professional skill that engages the clinician in character development (e.g., analysis of perceptions, habits of thought, emotional engagement), as well as skill development (e.g., evaluation of skill acquisition, effectiveness, efficiency) (Benner, Hughes, Sutphen, 2008). An example of critical reflection for character and professional development in the DAT is the Plan of Advanced Practice (PoAP). The PoAP is a reflective and adaptable plan to guide the scholarly practitioner to advanced practice throughout the course of a career. Chapter 2 of the dissertation is a product of my own critical analysis and self-reflection throughout the DAT program. The result is my PoAP, which includes my strengths and weaknesses as a professional, a clinician, and a scholar. The PoAP also contains an evaluation of my clinical competence, as well as an outline of my current knowledge and past professional experience. My clinical practice philosophies and goals for my professional future are also identified. The PoAP provides a plan for attaining advanced practice that is measurable, and allows for continued reflection and assessment as it is implemented.

The first iteration of my PoAP, completed in the summer of 2012, revealed that my professional path prior to the DAT was exclusively focused on acquiring clinical skills. All of my continuing education was directed toward manual therapies, new interventions, and patient care. Although I perceived myself to be a well-rounded

clinician with several skills, I was unable to say with any concrete evidence that I was adept at any of the skills I claimed to know, or that I was able to help my patients. Not only was I lacking in scholarly activity, I could not provide any proof of my utility as a clinician (i.e., my clinical skill and aptitude) beyond anecdotal evidence.

Clinical skill and aptitude are qualities of advanced AT practice (University of Idaho, 2011). One method for determining clinical skill is through the collection and analysis of global patient outcomes. Global outcomes are often assessed through clinician or patient oriented measures (Hostetter & Klein). Clinician or patient reported outcomes could be performance based (e.g., functional status), physiologically based (e.g., radius of infection), or clinically based (e.g., range of motion). Patient reported outcomes attempt to measure whether an intervention or service actually improved a patient's health or sense of wellbeing. The focus of patient reported outcomes is the needs of the patient and what they feel is important (Hostetter & Klein, 2012). Patient reported outcomes measures might be simple, such as the Numerical pain Rating Scale (NRS), or more complex like the Disablement in the Physically Active Scale (DPAS).

In the spirit of AR, with a focus on my clinical practices, I began collecting and analyzing individual patient outcomes to identify common themes and trends, recognize areas of weakness, establish a plan for change, enact change and measure improvement. Chapter 3 provides a summary and analysis of my clinical outcomes and the residency impact findings. Personal reflection, performance assessment, and analysis of global outcomes, illustrate the evolution of my clinical practice philosophies, the development of decision-making, and advancement of my clinical skill and aptitude.

The collection and analysis of global outcomes data provided necessary evidence for me to reflect, identify a need for change, and adapt. The insights I gained from the PoAP, as well as the analysis of global outcomes and products of my residency, motivated me to pursue clinical reasoning (CR) as an area of focus. Clinical reasoning requires clinicians to use their critical thinking ability, decision-making style, knowledge and experience, as well as the concerns of the patient, and any surrounding context, to inform action (Benner, Sutphen, Leonard & Day 2010). Clinical reasoning is a varied and complex system of processing information and making decisions that has an effect on every clinician's diagnostic and treatment abilities (Banning, 2008).

Chapter 4 contains a review of the literature that establishes a history of CR in healthcare, discusses current concepts in CR, and explores the prevalence of CR research in the context of AT. The review of literature forms the foundational context for the action research product found in Chapter 5. Chapter 5, a mixed-methods research study, serves as evidence of the skills developed in the research classes and my development as a researcher examining clinical reasoning. Though this is only a small piece of my research activity over the past two years, it is the foundation of a line of research that I will continue for the duration of my career. Together, Chapter 4 and 5 provide evidence of my knowledge growth, development and refinement of an area in which to pursue advanced practice, and the creation of scholarly products, driven by my professional responsibility to discover and share AT relevant information.

The chapters of the DoCPI create evidence of my transformation into a scholarly practitioner on a path toward advanced practice, in fulfillment of the requirements of

the DAT. By utilizing an AR philosophy, I have become a reflective clinician with the ability to analyze my patient care to achieve improved outcomes. My PoAP has established my path toward advanced practice, on which I have already accomplished several goals. Through the review of literature, I have demonstrated my foundational knowledge of my chosen area of focus. Finally, my research products (Chapter 5, Appendices 2-10) provide evidence of my development as a scholar. The end result of the DoCPI is a comprehensive document expressing the impact the DAT has had on my clinical practice, development as a scholar, and professional life.

CHAPTER 2

Plan of Advanced Practice: Accepted Version of March 1, 2014

Current Clinical Competence

Reflection on Professional Experience and Development

My journey into AT began as an injured athlete in high school. Without knowledge of the medical system, I visited an orthopedist for my chronic shoulder pain, and surgery was the only treatment option presented to me. I chose not to pursue surgery and took it upon myself to search out other avenues of treatment. My treatment included physical therapy, chiropractic care, strengthening programs, and several other manual therapies I sought out on my own. During that period of searching, I experienced treatment options alternative to what an orthopedic surgeon could offer, and I gained an interest in manual therapies.

Ultimately, a combination of interventions helped me return to the pool, but it was exposure to Muscle Activation Techniques (MAT) that directed my future toward health care. In 2004, I took a 12-week intensive course to become a MAT practitioner. The instruction introduced me to isolated manual muscle testing, palpatory examinations, and postural screening for the first time. Retrospectively, it was my first experience to the clinician side of a therapeutic intervention, and a glimpse into the allied health profession. As a 17 year old at the time, I was too focused on the educational content to realize that I was comfortable in the role of a clinician and was naturally skilled at handling the human body. I was unfamiliar with muscular origins and insertions, angles of pull, and arthrokinematics, so my attention was focused on

procedure. I did not consider pursuing manual therapy as a career at the time; I considered the experience part of the foundation for my upcoming education.

When I entered college in 2005 and competed at the National Collegiate Athletic Association (NCAA) Division I level, I discovered AT for the first time. The moment I walked into the AT Clinic at the University of Southern California (USC) and received specialized treatment I knew my life-long calling would be AT. There was not an AT program (ATP) offered at USC, but the Bachelor of Science in Kinesiology curriculum was focused in physiological, biochemical, biomechanical, neurological, and psychological principles. The specific coursework was the ideal foundation for my future in AT.

My undergraduate education as a Kinesiology major and athlete at USC provided me with the opportunity to see the world from both patient and clinician viewpoints. Participating in athletics at an elite level provided me first-hand knowledge of the commitment, pressures, and physical toll required of my future patients. I also gained valuable experience in the performance center with hundreds of hours spent training with strength and conditioning specialists over the course of my four-year career.

As an injured athlete, I also learned valuable lessons about health care from a patient's viewpoint. I learned that pain is personal, trust between clinician and patient is imperative, and quality care is obvious to a patient. From the clinician viewpoint, my course work in anatomy, advanced physiology, and biomechanics began laying a sound foundation for future clinical knowledge. The comprehensive nature of my foundational knowledge made me inclined to prefer whole patient care. The Advanced

Biomechanics curriculum, one of the foremost in the country, taught me to consider the entire kinetic chain when performing an evaluation. I was also introduced to the original research process for the first time and was given the opportunity to work under Dr. Jill McNitt-Gray to complete my own directed research entitled "Kinematic Analysis and Comparison of the Body Weight Squat and the Freestyle Flip Turn in Elite Male Distance Swimmers."

Completing my degree at USC, however, also had its limitations. Primarily, because there was no formal ATP and very few courses emphasizing sports medicine, I was not able to learn basic AT skills offered at other institutions. Second, due to my full-time participation in athletics, my free time was significantly limited and I was not able to simultaneously apprentice as an athletic training student (ATS). Furthermore, the AT staff felt it was a conflict of interest for me to gain clinical experience while participating as an athlete. For these reasons, I decided to continue my education at USC for an additional semester after receiving my diploma in 2008. I used this extra time to gain hours of experience in the clinical setting and become eligible to apply for an AT program.

I applied for, and was accepted to, the California Baptist University (CBU) professional Master of Science in Athletic Training (MSAT) Program in 2011. The program was only 2 years old and had just attained its accreditation with the Commission on Accreditation of Athletic Training Education (CAATE). Even in its infancy, the CBU ATP had a strong curriculum focused on providing sound orthopedic evaluation skills to its students. Courses provided me additional knowledge on which to further build my educational foundation, with specific learning objectives in line

with the 4th edition Educational Competencies as created by the Professional Education Council (PEC) and required by CAATE. Didactically, the program prepared me to evaluate athletic related injuries at the same level as other entry-level students in the country. Philosophically, however, the CBU ATP encouraged critical thinking, developed clinical decision-making skills, and fostered personal development and growth. The authentic and caring nature of the faculty allowed for one-on-one mentorship that I had not previously experienced in my education or athletic career.

A benefit of the CBU program was the small class size. My cohort totaled 11 students, which meant the faculty were dedicated and highly involved in our experience as students. The faculty created an environment of high expectations that pushed my fellow students and me to challenge ourselves in the classroom and in clinical experiences. The small class size also meant Preceptors, then termed Approved Clinical Instructors (ACIs), and clinical sites were not overwhelmed with too many students. As a result, I was able to have individual learning opportunities, gain experience traveling as an AT student (ATS), and had ample access to patients to build my skills as an athletic trainer. The clinical rotation opportunities provided to me through CBU's program helped me gain experience with several types of electronic medical records (EMR) software, rehabilitation philosophies, personality types, and patient demographics.

In my fifth and final semester at CBU, I was assigned to the ACI of the University of California, Riverside's Baseball team for the duration of their season. Due to the distance between the field and the AT clinic on campus, I was able to "play athletic trainer" so to speak, by maintaining a presence at the field during practices each day.

My responsibilities were to prepare the team, keep track of injuries and rehabilitation, communicate directly with the coaching staff, and provide manual therapies, stretching, and triage at the field.

I was also responsible for communicating the details of my, and the players', actions to my ACI each day. In reflection, since I was not directly supervised at all times, and did not get as much feedback as I could have, it was not the ideal situation. However, I was able to practice skills, make decisions, and manage a team with a fair amount of autonomy. The experience gave me a passion for working with baseball athletes and a deeper understanding of the mechanics of the upper extremity. For the first time, I personally felt the pressure of a team looking to me for help, guidance, and healing. I was given a glimpse at the real picture of AT.

Opportunities to learn new techniques were also provided to me during my time at CBU. Prior to graduation, I completed Kinesio Taping and Tecnica Gavilàn Instrument Assisted Soft Tissue Mobilization (IASTM) certification courses, and obtained Certified Strength and Conditioning Specialist (CSCS) status through the National Strength and Conditioning Association. Upon graduation, I felt ready to perform as an athletic trainer in a manner that would make CBU proud.

Shortly after passing the Board of Certification (BOC) exam, and due largely to the professionalism, awareness, and mentorship I was introduced to at CBU, I was hired by the Medical Director of the CBU ATP, Dr. Greggory Heinen, as his physician extender. Dr. Heinen was part of a 13 physician orthopedic clinic in Riverside, CA. We were able to see between 40-65 patients per day, 4 days a week. My duties were to take patient histories, document using the EMR software, and perform full evaluations,

including ordering films if needed, before transferring care to Dr. Heinen. I was able to gain a significant amount of experience working with physicians in a direct care setting and adjusted to the higher level of professionalism expected in the office setting. In the 5 months that I was under Dr. Heinen's employment, I honed my patho-anatomical evaluation skills and learned the basics of reading diagnostic images (e.g., magnetic resonance imaging, radiographs). However, as I reflected on my happiness in the physician extender role, I was not content being unable to treat patients. I felt my manual therapy and therapeutic intervention skills were not being utilized. Oddly enough, it was around that time that I received a call from Pepperdine University in reference to an application I had filled out several months prior.

I chose to pursue the employment opportunity at Pepperdine, and began working there in February of 2012, so that I could return to treating patients as a clinical athletic trainer. I felt immediately comfortable working in the familiar NCAA Division I athletic setting. Working with sand volleyball, tennis, basketball and cross-country was exciting and fun, but I was not being stimulated as a professional. I found ways to challenge myself by taking on additional patients, volunteering to complete additional duties in the clinic (e.g., elements of the budget, editing the policies and procedures manual, etc.), and serving as a Preceptor for four undergraduate students from California State University, Northridge.

In April 2012 I received a call from my mentor, who was in the DAT program at the time. He helped me to realize that I was taking on additional responsibilities because I was not feeling challenged in my patient care, specifically. As we discussed the DAT and a possible future career path into academia, I found myself, at least

initially, uninterested in pursing these options as the answer I was searching for at the time. I was more intrigued by a technique he mentioned, a Mulligan Mobilization with Movement (MWM) for treating an anterior fibular positional fault in lateral ankle sprains. After researching the technique and contemplating a career shift towards academia, I was reaffirmed in my belief that better patient care was possible. As a result, I decided to apply for the DAT and began in the summer of 2012.

Honest reflection of my weaknesses and struggles in my first year of the DAT, which will be addressed in *Reflection on Weaknesses*, led me to leave Pepperdine University after 18 months of employment and pursue a position at California Baptist University in a teaching capacity in August of 2013. I began teaching the clinical courses of the core curriculum, including upper and lower extremity evaluation, manual therapies, and integrated rehabilitation courses. Starting a new job, in an area of specialty of which I had no prior training, has been challenging and fun. I have enjoyed teaching, and while I miss being a full time clinician, my patient care (on a referral basis) has improved dramatically.

As a professor, I have been encouraged daily by the brave enthusiasm that my students and I share. I have also discovered a new sense of responsibility to upholding best practice, to searching out and critically appraising clinically relevant literature, and to providing my students with the professional responsibility of pursuing advanced practice. As a clinician, I have found more time to spend reflecting on my patient cases and in search of evidence based practice (EBP) in the literature. Having time to be introspective has increased my cognitive capacity and the depth of my

understanding of techniques and paradigms. I have been able to carry this into my clinical practice and my teaching.

Reflection on Current Knowledge

To rate my knowledge and clinical ability on a continuum of novice/entry-level to expert, I would first need to define novice, expert, and the area in between. To create definitions, characteristics and elements of novice and expert need to be identified. What are the determining factors of expertise? Is an expert someone who has many years of experience? Are newly certified athletic trainers automatically novices because they have only just begun their professional journey? Do experts have better patient care, better patient outcomes, and/or more knowledge? Researching these questions helped me to discover one of my focus areas and helped me reflect more appropriately on my current knowledge.

When I first decided to apply for the DAT as a young professional (i.e., less than 3 years of experience), I believed my knowledge at the time to be intermediate, or above entry-level, in most areas. My foundational knowledge was sound and grounded heavily in biomechanics and anatomy. I had more manual therapy skills than my peers and most of my more experienced colleagues. I was practicing with ease at the Division I level, a level many ATs work their whole careers to reach, with good knowledge of emergency management and administrative duties needed to practice in the university setting. I was also confident in my evaluation skills because of my previous experience as a physician extender.

My reference for determining my clinical competence at the time, was the core competencies of AT as set forth by the PEC. I thought that if novice athletic trainers

were competent, then expert athletic trainers were proficient in the skills outlined by the PEC. After the first summer's coursework in the DAT, however, I was made aware of how much more there was to learn than what was in the competencies. I realized that the core competencies, the reference point I was using to rate ability level, were meant as the most basic requirement for acquiring and maintaining certification (National Athletic Trainers' Association, 2006), and the NATA's agreed upon definition of entry-level, novice practice. Therefore, on this scale, I ranked myself above entry-level, because my knowledge and skills exceeded those outlined by the NATA.

Retrospectively, my ability upon entering the DAT was where I originally believed it to be, but expertise was much further down the continuum than I could initially see. I proposed that expertise is a fluid continuum. As I gained more information, learned different skills, and found new depth in the skills that I already practiced, I also realized how much more there was to know. To illustrate, imagine a 5-point scale: novice= 1, and expert= 5. When I began the DAT I would have considered myself to be a 2.5, an intermediate level clinician. At the end of the first summer session however, I felt supremely unknowledgeable and inept compared to the professors, and the practicing athletic trainers they were referencing, and would have reconsidered myself a 1. Over the course of the next year as I reflected, named my strengths, identified my weakness, and learned more about expert practice, I affirmed that I was above entry level. I began to understand that as I take steps closer to reaching the 5 on the scale, the scale itself is expanding. Novice as labeled 1 on the scale is concrete and will never change; however expertise will continue to expand to a 10, 25, 100-point scale and so on.

The practitioners who I had thought would be categorized as expert athletic trainers, were actually novice athletic trainers with many years of experience. Only the novice end of the continuum is easily identifiable, and AT has yet to define expertise in our context or establish a path for its achievement. The DAT curriculum taught me that the choice of how to define expertise, and the task of creating a path toward it, is mine. During my second and third evolutions of the PoAP it became clear to me that one of the purposes of the DAT program was not only to expose me to some of the current information of advanced clinical practice, but to teach me the tools I would need to continue on a path toward expertise in my chosen areas of focus that have evolved from the first iteration (Appendix 1). My current PoAP includes themes beyond the procedural knowledge needed to implement new clinical interventions. Scholarly practices, such as publishing and presenting works at conferences, are included in my new goals. Ultimately, the DAT has allowed me to being the process of becoming an advanced practitioner. Following the principles and applying the lessons I have learned, I will create a living example of expertise in my individual chosen areas of focus. My journey in the DAT became the path toward advanced practice in AT that I did not previously know existed in the profession.

Reflection on Strengths

As a clinician I like to practice whole person care, not simply treat the obvious location of pain. I enjoy seeking out factors that influence or contribute to a patient's complaint. I enjoy seeing things differently and asking questions to gain a new perspective. I find that my inquisitive nature has served me well in developing a decision making process that aims to create purposeful practice. I feel that doing things

without purpose or understanding is futile, and so I try to avoid the "shotgun" approach to patient care entirely. I appreciate implementing interventions independently to gauge their utility. I am open to trying new things and feel I am a lifelong learner. I have pursued additional learning opportunities, attended several conferences and events per year, and applied several new techniques to my practice since completing my professional master's degree.

My clinical strengths are my evaluation and assessment styles, manual therapy skills, and clinical reasoning. I believe my knowledge of orthopedic evaluation and surgical treatment options is advanced intermediate for an athletic trainer. I have confidence in my referral choices, which is a strength when examining patients and communicating with other health care professionals. Because of my background in biomechanics, I also have a strong understanding of the kinetic chain. I am able to utilize regional interdependence in my evaluations and practice the Selective Functional Movement Assessment (SFMA) with confidence. I have become adept at identifying dysfunction more quickly and efficiently using the SFMA system, seamlessly integrating it with my previous biomechanical knowledge.

Having a more effectual evaluation style has also allowed me to strengthen the application of the manual therapy interventions I practice, as well as incorporate new interventions. Prior to the DAT, I was practicing Muscle Energy Techniques (MET), Active Release Techniques (ART), Gavilan Instrument Assisted Soft Tissue Mobilization (IASTM), Muscle Activation Techniques (MAT), Positional Release Therapy (PRT), Proprioceptive Neuromuscular Facilitation (PNF), McKenzie Mechanical Diagnosis and Treatment (MDT) of the Lumbar Spine, Kinesio taping and joint mobilizations. In the

two years of the DAT I have also learned Dynamic Neuromuscular Stabilization (DNS), Mulligan Concept Mobilizations, McKenzie MDT of the Lower Extremity, Total Motion Release (TMR), and Primal Reflex Release Technique (PRRT). I have also learned several psychosocial interventions such as Reflexercize, Emotional Freedom Technique (EFT), and Grateful Heart Technique. As a result of my preference for and training in manual therapy, I feel I have an above average or intermediate ability to use my hands in treatment.

Sound clinical reasoning has also become a strength of my clinical practice. Having the ability to perform special tests or practice several interventions does not equate to good patient care or positive outcomes. Prior to the DAT, my professional path was heavily focused on acquiring clinical skill and sound evaluation techniques. My early PoAP draft is an example of my focus in skill acquisition carried over into my first set of goals. I had a myriad of skills, and the ability to evaluate my patients, but was lacking the evidence to connect my skill level to my patient care outcomes. Completing my research project in the DAT led me to pursue clinical reasoning as one of my chosen areas of focus so that I could remedy this problem. Through the collection and analysis of patient outcomes, and a close inspection of my decision making and reasoning, I was able to identify common themes. I now have a stronger awareness of my decision-making style, my attitudes, my patients' concerns, environmental factors, and other elements that influence my clinical reasoning. Heightened awareness has stemmed, in large part, to the metacognitive practice I have developed over my time in the DAT program.

Currently my scholarly strengths are few. Public speaking is a strength of mine, and I have spoken at several conferences, even as a student. In the past year, I made a goal to present at local, state, regional, and national conferences. Locally, I was asked to participate on an expert panel at the Cedars-Sinai/USC Judy Kauffman Dance Medicine Conference. At the state level, I presented at the California Athletic Trainers' Association State Meeting and Symposium sharing the intra-professional educational initiatives my colleagues and I had executed in tandem with the CBU School of Nursing. Regionally, I completed 3 poster presentations at the North West Athletic Trainers' Association Annual Meeting and Symposium (Appendices 2-4). I also worked with several students to have 5 poster presentations (Appendices 5-9) and 1 podium presentation accepted at the Far West Athletic Trainers' Association Annual Meeting and Symposium. June 2014 will mark the achievement of my goal, with my presentation of a learning lab session at the National Athletic Trainers' Association (NATA) Annual Conference and Expo on the regional interdependence model and movement systems in evaluation.

Recently, I have discovered a new set of academic strengths through my current teaching position at CBU. I have enjoyed sharing knowledge in a classroom setting and have received positive feedback from the students in the two semesters I have taught. I have much to learn about what it takes to be an effective teacher, and every day is both a learning opportunity and a chance to provide mentorship. My new position illustrates a strength I did not possess prior to the DAT: I have the ability to step into the unknown, represent and share my knowledge while recognizing my weaknesses in a genuine manner, and act mindfully.

Specific strengths are listed as follows:

1. I approach each patient case as an opportunity to learn, and an opportunity to be an advocate for the best interests of my patient.
2. I enjoy a challenge and am willing to work hard to accomplish a goal.
3. I am dedicated to becoming the best clinician I can be for my patients.
4. I am passionate about the AT profession and am dedicated to its development in allied health.
5. I am dedicated to enthusiastically providing up to date, evidence-based information and cutting edge concepts to my students.
6. I have experience in a variety of clinical settings, with a variety of patient demographics.
7. I am a very "hands on" clinician, proficient in several manual therapy techniques, and chose patient care over patient management.
8. My understanding of biomechanics, anatomy, and regional interdependence helps me meet the needs of my patients, outside of the patho-anatomical model.
9. I understand the meaning and value of outcomes measures in patient care, to guide my own practice, to create practice-based evidence in AT, and to help the value of AT to be recognized in health care.
10. I am able to integrate several paradigms evaluate and treat to accomplish whole-patient care.
11. I have an awareness of my clinical reasoning styles, biases, and errors, as well as a system of check and balances for continued self-evaluation.
12. I have a natural ease when public speaking and enjoy sharing knowledge via presentations and conferences.
13. I recognize the value of criticism, I want to always pursue improvement, and know that I need help to accomplish the goals I have set for myself.

Reflection on Weaknesses and Areas for Improvement

Given the chance to reflect on my weaknesses, I firmly believe that I have, and will always have, room for improvement in my patient care and in other aspects of my professional life. My previous employment positions made it difficult to find the time I needed to reflect appropriately, and did not foster an environment of professional, personal, or clinical growth. I decided to pursue a working environment that allowed me room to develop in those areas. When I accepted the position at CBU, I discovered a greater depth in my reflections. I was further encouraged to actively pursue

professional and personal development, which has helped me to begin to address many of the weaknesses with which I started the DAT program.

During my first semester in the DAT I accepted that many of my past clinical decisions were not based in the most current literature or best practice. Instead, my decisions were blindly founded on my education and training, despite knowing new knowledge had been disseminated. Any EBP present in my clinical practice resulted from my education at CBU, but I tended to use anecdotal evidence from patient experiences as justification for my clinical choices; my treatment choices were often unfounded. Recognizing that I want to be a clinician who makes informed, effective choices in her patient care, I have made significant strides in the last two years towards more scholarly practice.

I quickly discovered that the clinical applications of scholarly practice (i.e., outcomes collection and analysis) were not difficult for me. I was able to implement measurement tools to assess the utility of my patient intervention choices and application. I was able to identify areas of my patient care that were lacking, such as psychosocial interventions, and take steps to strengthen areas of weakness. The critical appraisal and dissemination of research, however, was a weakness of mine. I had only presented at two local conferences in my 3 years as a professional, and I knew I was capable of contributing much more to my patients, my community, and the profession. Public speaking was not a weak area of mine, but scientific writing was something I have struggled with throughout my career. To begin strengthening this area of weakness I researched, wrote, and have submitted a manuscript for publication in the International Journal of Athletic Therapy and Training (Appendix 10). I need to

continue writing to improve my ability to generate organized and thoughtful products to share with my peers. I also do not have significant experience in statistical analysis. I would like to learn to more effectively utilize statistics so that I can better create and share meaningful data.

I also recognize that, as a young professional, I have communication skills and political prowess to develop. I am a trusting individual and can sometimes struggle with the professional dynamics of an office setting. I do not yet have the experience in academia to understand the motives and expectations of the administration. While I feel that I have discovered a natural ability in teaching, I need the help of others around me to foster my growth in the academic setting, which is very different from what I have been accustomed to in my past experiences with athletics.

Specific areas I would like to improve:

1. Improve my knowledge of EPB, specifically related to evaluation and care of neuromusculoskeletal pain and injury.
2. Remain committed to chasing EBP and practice-based evidence.
3. Create research within my patient care and publish the findings in appropriate peer-reviewed journals.
4. Practice scholarship by attending and presenting at conferences.
5. Improve my scientific writing ability to produce clear, articulate, and informative pieces to submit for publication.
6. Ask for help from established scholars and clinicians, and gain mentorship from experts.
7. Improve knowledge and application of statistical analysis.
8. Study the leadership and communication styles of successful clinicians and academics.

Goals for My Professional Future

My current position as a professor at CBU has been exciting and new. I am enjoying the academic side of AT much more than I had initially expected. I would like to continue teaching in this capacity for the near future, but desire to create more

opportunities for myself to practice as a clinician more frequently. I currently see patients on a referral basis, which has suited me well for the time being. The patients that I see are usually difficult cases so they challenge me and provide an opportunity to make profound change. However, I would like to ultimately return to a greater percentage of my time being spent in clinical practice, possibly in a part-time dual professor/clinician role. I miss full-time patient care, but I enjoy working to propagate excellent manual therapy skills, clinical reasoning, and reflective practices by instilling them in students who will become the next generation of clinicians. I believe there is a need in our profession, and in education, for clinicians who set an example of expert practice, and I would like to help meet that need.

Clinically I would like to continue pursuing advanced practice in manual therapies and in clinical reasoning. I would like to help share my knowledge of manual therapy interventions by inspiring clinicians to pursue additional training in various techniques that are effective in AT (e.g., PRT, PRRT, Mulligan Concept, DNS). I would like to produce evidence for the utility of techniques in AT by collecting data in my own patient care and teaching other clinicians to do the same. I want to highlight techniques that decrease pain and increase function quickly. Athletic training is traditionally practiced in fast-paced, high patient-volume clinics, so techniques that have profound immediate effects will be intriguing and clinically meaningful to athletic trainers I would also like to continue treating patients with several clinical paradigms and create research on the integration of various complimentary interventions. I would like to continue learning new techniques and understanding new paradigms, and cultivating my depth of understanding of the current tools that I utilize. I would like to become

certified in the use of the SFMA and become an expert in the evaluation and treatment of neuromusculoskeltal dysfunction. I would also like to explore the pain neuromatrix, specifically ways that clinicians might be able to create a representation of a patient's neuromatrix to explore elements that are contributing to physiological regulation of the body due to pain.

The effectiveness of any treatment is determined by several factors, such as intervention choice, application (e.g., timing, order, and repetitions), the patient's mindset (e.g., mood, relationship with clinician), and even the clinical environment (e.g., wall color, noise level and characteristics, other people in the room); all elements of clinical reasoning. Clinical reasoning of athletic trainers has not been studied in the professional setting. I would like to continue studying clinical reasoning in the context of AT, with the goal to first discern the unique elements that set AT apart from other health care professions, and to then determine elements of novice and expert clinical reasoning in AT. Specifically, I would like to utilize the "Google Glass" camera system to study clinicians practicing in real time on patients in actual clinical settings. A definition of clinical reasoning in AT will then allow me to create an evaluation tool that can be used to identify the clinical reasoning ability of clinicians, students and professionals alike.

Finally I would like to begin providing service to the AT profession in a more official capacity. I feel that if I believe there are changes that need to be made, I should be a catalyst for that change. The leadership in AT, in the form of our NATA Board of Directors, and the district and state counterparts, acts to provide direction for the

future of AT. I would like to take a more active part in helping direct our future by participating in the leadership of our profession.

Athletic Training Philosophies

Patient Care Philosophy

My patient care philosophy maintains a heart for my patients, mind for best practice and integrated techniques, and spirit of purpose. The needs of my patient are at the forefront of every decision I make. I want to relieve pain, increase function, and help my patients better their quality of life in the most effective and efficient way possible. I want to be resolute in my decision-making and clinical reasoning, so that each intervention choice has a specific purpose and can be integrated with others seamlessly, at the correct time, to accomplish treatment goals more effectively. I also want to help educate my patients to participate in their healing. I will teach my patients ways to decrease their own pain through self-treatments and modifications of daily activities, and to illustrate for them the power of their actions in their own treatment.

To live out my philosophy, I will strive to attain the qualities and characteristics of a scholar within my chosen focus areas of practice. I need to be dedicated to appraising the literature and staying up to date on concepts of pain, function, and clinical practice. I will continue seeking learning opportunities, both formally (e.g., continuing education courses) and informally (e.g., patient care), and in collaboration with other clinicians. I will record and analyze the outcomes of my choices and the clinical application of the interventions I practice, to assess my abilities. I will continually reflect on my assessments and make informed changes to improve my

patient care outcomes. I will share what I discover in my patient care and the knowledge I generate, by presenting at conferences and creating manuscripts for publication in appropriate peer-reviewed journals.

Teaching Philosophy

As a young professional in her first year of teaching, I am currently developing my teaching philosophy. The courses that I am teaching are clinical in nature, so there is a large influence of my patient care philosophy on my teaching style. I am learning the profound responsibility I have to my students, and to my profession, in providing them with current and accurate information. I want to instill in my students a strong sense of professional responsibility, scholarly attributes, and passion for patient-centered care. I want to share the lessons and techniques I have learned in the DAT in my teaching to provide my students with the tools they need to practice reflectively, produce evidence in their patient care, and create their own path toward advanced practice.

Research Philosophy

My responsibility as a clinician is to practice research in many forms. I need to conduct research on my own clinical practices to ensure reflective patient care grounded in evidence. If I can accomplish research in my patient care, I will continue to develop within my scope and will discover increasingly successful interventions. I also need to produce evidence for interventions and clinical practices for dissemination that will advance the profession of AT. Lastly, in the pursuit of evidence in my patient

care, I will strive to continue the cycle of translational research. As a researcher, I want to have the courage to be creative, to ask questions, and to explore alternative treatments that might benefit my patients or other professionals. I want to be diligent in my pursuit of truth and development of new knowledge. I must admit my assumptions, recognize my limitations, and be willing to change my ideas as new evidence emerges.

Justification of the Plan of Advanced Practice

The PoAP provides a blueprint, with measurable benchmarks and evidence of progress, for my unique path toward advance practice. Measurable and purposeful goals guide my progress and help keep me accountable. My goals, areas of focus, knowledge, and skill will change as I continue reflecting on my practice and narrowing my specific interests. The PoAP is a way to evaluate clinical competence, outline knowledge and experience, and allow for continual growth. I am happy with my progress and excited to continue using the PoAP as a catalyst for change in my practice.

By creating and implemtning my PoAP, I have diversified my clinical skills, improved my patient care, and helped me to identify and evolve my AT philosophies over the past two years. As a result, the PoAP has directly affected my patients, my students, and my colleagues. I have been able to provide more efficient and comprehensive healing to my patients. My students have also seen the direct results of the PoAP. I have expanded the relevant information I am able to share with my students, become more reliant on EBP, and given my students tools to do the same. I teach global outcome measures, provide opportunities for reflection, and speak

passionately about the future of AT. I believe the curriculum of the DAT, including the PoAP, have immensely influenced the professional development of my students.

I believe there is a dire need for the DAT in AT. The DAT curriculum and faculty provide the tools, motivation, direction, and mentorship athletic trainers need to reach advanced practice. I am honored and humbled to be part of the groundbreaking movement to advance AT in health care and am excited for the future, personally and professionally.

Plan of Advanced Practice Areas of Focus

I. Evaluation of dysfunction in the regional interdependence model.
II. Use of manual therapy interventions for the treatment of neuromusculoskeletal dysfunction.
III. Clinical reasoning in AT.

Plan of Advanced Practice Goals

I. Evaluation of Dysfunction in the Regional Interdependence Model
    a. Complete SFMA course work and certification
    b. Incorporate SFMA into clinical practice
    c. Exhaust the literature related to movement dysfunction
    d. Exhaust the literature related to Regional Interdependence, specifically the works of Janda, Sahrmann, and Cook

II. Manual Therapy Interventions for the Treatment of Neuromusculoskeletal Dysfunction
    a. Complete Dynamic Neuromuscular Stabilization: Part A, B, C courses
    b. Implement DNS into my clinical practice, record and analyze outcomes
    c. Complete Mulligan Concept Upper Extremity, Lower Extremity, and Advanced Courses
    d. Implement Mulligan Concept into my clinical practice, record and analyze outcomes
    e. Complete Positional Release Technique coursework, pass Certification Exam and Practical to become a Certified Practitioner
    f. Complete Primal Reflex Release Technique Seminars home study course

g. Implement PRRT into my clinical practice, record and analyze outcomes
h. Record and analyze patient outcomes of techniques already implemented into practice: PRT, McKenzie MDT for the Lumbar Spine and Lower Extremity, TMR, Kinesio Tape, MAT, ART, IASTM, PNF, and psychosocial interventions

III. Clinical Reasoning
   a. Exhaust the literature related to Clinical Reasoning
   b. Seek experts in pedagogy and clinical reasoning for mentorship and guidance
   c. Conduct informal inquiry of practitioners (e.g., colleagues, students), identify themes
   d. Conduct formal research of clinical reasoning in the specific context of AT
   e. Define clinical reasoning in the context of AT, identify the characteristics of an expert of clinical reasoning in AT
   f. Create a clinical reasoning rubric that will assess the clinical reasoning ability of AT students and professionals on a novice-expert continuum
   g. Implement outcomes measures of clinical reasoning in clinical practice
   h. Record and analyze the use of known elements of clinical reasoning in my clinical practice (biomedical knowledge, comfort level with clinical case, ability to articulate clinical cases) and map clinical case decision making with flow charts

IV. Scholarship and Research in Focus Areas of Advanced Practice
   a. Assess outcome measures of interventions guided by the SFMA in my clinical practice
   b. Assess outcome measures of singular interventions in my clinical practice:
      i. PRT
      ii. IASTM
      iii. DNS
      iv. PRRT
      v. ART
      vi. PNF
      vii. Kinesio Tape
      viii. McKenzie MDT
      ix. TMR
      x. Mulligan Concept
      xi. Psychosocial Interventions
   c. Assess outcome measures of integrating complimentary interventions in my clinical practice
   d. Participate as a reviewer for peer-reviewed publications (i.e., journal, text books)
   e. Present at local, state, regional, and national professional conferences

Plan of Advanced Practice Assessment

I. Evaluation of Dysfunction in the Regional Interdependence Model
   a. Analyze outcomes of clinical practice
   b. Perform critical reflection, involve others in discussion
   c. Adjust practice based on outcomes, create new treatment model

II. Manual Therapy Interventions for the Treatment of Neuromusculoskeletal Dysfunction
   a. Analyze outcomes of clinical practice
   b. Perform critical reflection, involve others in discussion
   c. Adjust practice based on outcomes, create new treatment model

III. Clinical Reasoning
   a. Conduct clinical reasoning research and create manuscript for professional publication
   b. Present clinical reasoning research at professional conferences

IV. Scholarship and Research in Focus Areas of Advanced Practice
   a. Conduct clinical reasoning research and create manuscript for professional publication
   b. Collect outcomes utilizing the singular therapeutic interventions in my clinical practice and present results at professional conferences
   c. Collect outcomes utilizing complimentary therapeutic interventions in my clinical practice and present results at professional conferences
   d. Collect outcomes utilizing the SFMA as a diagnostic tool for dysfunction in my clinical practice and present results at professional conferences

Chapter 3

Outcome Summary and Residency Findings and Impact

The Outcome Summary and Residency Findings and Impact provide evidence of the realization of my clinical practice philosophy, growth in my patient care, and evolution toward advanced clinical practice. The summary consists of three parts: 1) A narrative describing the evolution of my patient care philosophy, 2) A chronological exploration of the coursework and residency findings from each semester, and 3) A final reflection summarizing the residency's impact for the future. In this chapter, I will discuss the global outcomes measures I collected in my patient care, share excerpts from reflections, and outline goals for each semester. The information is outlined to illustrate the cyclical nature of an action research philosophy in patient care and the compounding growth toward advanced practice throughout my time in the DAT program.

Narrative Evolution of Patient Care Philosophy

Learning new ways to assess a patient and apply new interventions is easy. Implementing new paradigms into an already established philosophy, however, is exceptionally challenging. I did not experience a true shift in my patient care until I studied and fully understood the philosophies behind the changes I was trying to make in my practice. For example, prior to the DAT and learning more about James Cyriax's style of evaluation, my procedures followed an approach similar to Magee's orthopedic model. David Magee, the author of "Orthopedic Physical Assessment", was a proponent of extensive and in-depth evaluations. His comprehensive style focuses on compiling

facts in combination from clinical, physical, provocative, laboratory, and imaging studies. Magee's philosophy mirrored the biomedical model which pairs knowledge of the pathological process of tissue healing with information found in examination to determine the structure involved in a patient's complaint (Magee, 2013). My basic evaluation skills were initially in line with Magee and the biomedical philosophy.

Several of the special tests described in his textbook, and used in my clinical practice, have poor reliability and validity (Malanga, Andrus, Nadler, McLean, 2003; Cook, Beaty, Kissenberth, Siffri, Pill, Hawkins, 2012; Hegedus, Goode, Campbell, Morin, Tamaddoni, Moorman, Cook, 2008). Prior to learning Cyriax's philosophy I felt this oversight was just the nature of the biomedical model. After studying the model, I found that the patient care philosophy was much more in line with what I wanted mine to be. The philosophy was in line with my desire to be efficient, to not use superfluous tests, or waste time with portions of an exam that have limited reliability. I also felt that structures could not be entirely isolated and believe the clustering of several special tests is better practice for determining a diagnosis, as is part of the Cyriax philosophy (Cyriax, 1993).

Cyriax has been called the father of modern musculoskeletal diagnosis and treatment; not because he developed innovative tools, but because he was the first to take a comprehensive look at the clinical evidence and develop an integrated and systematic evaluation process (ETGOM, 2013). The purpose of the Cyriax evaluation was to assess the structural integrity of the locomotor system for lesions (Cyriax, 1993). Cyriax focused on diagnostic reasoning, placing emphasis on the importance of diagnosis in choosing the right course of treatment.

In his time, primarily the 1940s-60s, clinicians could not rely on advanced diagnostic imaging (e.g., MRI, CT scan) for diagnosis, as only rather primitive radiographs were available. Inflammation was accepted as a response to tissue healing, and regarded as *the* cause for musculoskeletal pain. Cyriax's evaluative process was focused on the biomedical model, but included soft tissues and joint relationships, which was not the standard practice for orthopedists in his time. He was a strong proponent for manipulation and joint mobilization, injection therapies, and was the first to introduce transverse friction massage (Cyriax, 1993).

As medical science evolved, some of the information Cyriax used became outdated and his original evaluation processes were updated to include the new information (Pellecchia, 1996). The European Teaching Group of Orthopedic Medicine (ETGOM) has continued the tradition set forth by Cyriax by creating an evolving diagnostic tool meant to be as specific and valid as possible, a product of EBP, called Modern Orthopedic Medicine (ETGOM, 2013). I was relieved and excited to find this reference. I was not looking forward to spending more time researching best practice for the biomedical portion of my examination, on which I am relying less and less.

The biomedical examination model is valuable in part due to its terminology, which allows me to communicate with my patients in a manner with which they are comfortable. On several occasions, I have taken extra time with a patient to educate them the difference between the structural and functional integrity of their body. Patients seek to understand their injury, but often do not have any prior experience with certain terms (e.g., dysfunction) being used synonymously with diagnosis.

The biomedical language also allows me to speak with other clinicians in a way that fosters understanding. When I began the DAT program, I used only biomedical terminology during class discussions and in blogs about patient cases. Slowly, a noticeable shift took place as I began to move away from this traditional labeling and started to use new terms (e.g., positional fault, motor control dysfunction, tissue extensibility) to articulate patient cases. I discovered that the biomedical model was not able to properly account for all of my patient presentations, in truth only a very small fraction, so it was of paramount importance to explore different classification systems. The more I practiced, the more complexity I recognized in my patient cases. Simultaneously, the more I was being exposed to new information, the more I discovered the underlying mechanisms for a patient's pain cannot be forced to fit nicely into a single category.

Part of my responsibility as a clinician is to decide how to best classify my patients within the paradigms that I practice. When I formally reflected on my practice, I realized that I could most patients under any most paradigms. For example, I could evaluate a patient presenting with signs and symptoms of lateral epicondylitis and treat them under the biomedical paradigm with non-steroidal anti-inflammatories (NSAIDS), progressive exercise, or simple rest (Johnson, Cadwallader, Scheffel & Epperly, 2007). Under the paradigm of PRT, I could assess tender points (TPs) and treat by releasing the TPs in the forearm, shoulder, and thoracic musculature. Under the Mulligan Concept, I could evaluate for a positional fault by laterally gliding the olecranon while the patient performed pain-free gripping (Miller, 2000). If I can classify and treat the same patient with several different paradigms (e.g., the

biomedical model, PRT model, Mulligan Concept model) my choice as clinician to utilize one intervention paradigm over another must be grounded in evidence. I can document outcomes that serve as practice-based evidence in my patient care.

I also have the professional responsibility to identify weaknesses in my patient care and search for interventions that are the best fit. While reflecting on my weaknesses in my first PoAP, I discovered that I was not comfortable with my skill or knowledge in joint mobilizations. Prior to the DAT, I had not been exposed to the Mulligan Concept and was using a few isolated thrust manipulations for the thoracic and lumbar spine, and sacro-iliac joint; however, I was not utilizing the correct assessment procedures for determining whether a manipulation was warranted.I sought to remedy this by: 1) Attending the Upper Extremity and Spine Mulligan Concept course, 2) Researching clinical prediction rules for specific joint mobilizations, and 3) Implementing clinical prediction rules into my clinical practice.

Through research, collecting outcomes, and discussing clinical practice in the DAT, I learned that joint restrictions have several possible etiologies [e.g., genetic, articular, muscular, and neural](Sahrmann, 2002). My assessment must be able to determine the primary contributing factor so that my mobilization has a lasting effect. As a result, I have been more interested in Mulligan Concept mobilizations than any other mobilization paradigm because learning the concept caused a shift in my patient care philosophy regarding joint mobilizations. Upon reflection, I believe this is due mostly to the demographics of the patients I primarily see. One of the proposed mechanisms for a positional fault is the muscular and tendinous pull surrounding a joint that is imbalanced (Mulligan, 1993). Irrespective of if this is the cause or a

secondary symptom of other dysfunction, I believe most of my patients report with some kind of imbalance of this nature.

Before implementing the Mulligan Concept, I took an approach that was more in line with Sahrmann, and believed that the only way to treat this kind of dysfunction was with in-depth biomechanical analysis and weeks of corrective exercises. Several key pieces of Sahrmann's philosophy that I had previously applied in my practice were: 1) repetitive low level trauma or high magnitude stress of daily activities or deviations from normal activities can cause degenerative change, 2) balance and alignment of the joint ensure equal load and equal wear over time, lack of balance or precision in movement cause pain, 3) movements occur through the path of least resistance and there is usually a directional susceptibility of movement at each joint based on the balance of the tissues surrounding it (Sahrmann, 1998; Sahrmann, 2002).

Learning more about Sahrmann's paradigm, I realized that her view is biomedical in nature. She emphasizes using movement patterns to stress various structures to identify syndromes within her classification system. By using logically outlined diagnostic schemas, her paradigm diagnoses movement impairments, alignment and structural variations and acquired impairments, relative flexibility and stiffness impairments, and muscle and recruitment pattern impairments (Sahrmann, 1998). The four types of dysfunction are almost identical in definition to the dysfunctions of the SFMA (i.e., joint mobility dysfunction, tissue extensibility dysfunction, stability and motor control dysfunction) (Cook, 2010). I find that the SFMA is more applicable and easier to understand, though Sahrmann's procedures

have inter-rater reliability (0.61 Kappa Coefficient, $p<0.001$) and the reliability of the SFMA has not been established (Trudelle-Jackson, Sarvaiha-Shah, Wang, 2009).

A common theme of the Mulligan Concept, the SFMA, and Sahrmann's paradigm, is the neuro-reprogramming component. Before the DAT, I did not consider the central nervous system (CNS) or the role of the primary motor cortex in my patient care. After attending my first Dynamic Neuromuscular Stabilization course (DNS, Part A), I had a better understanding of the spinal stabilizing system and the role that it plays in maintaining joint centration in the spine and the extremities. Additionally, if I had not taken this course, I do not think I would have understood neuro-reprogramming and the relationship between the nervous system and coordinated muscular control.

The creators of DNS placed emphasis on coordinated muscular orchestration in the core and the effective transferring of loads. I gained an understanding of the importance of the timing and synergistic relationship of the diaphragm, pelvic floor, abdominal wall, and back muscles. Training the core for strength without first addressing proper nervous system control, may only serve to train existing non-optimal patterns. Dynamic Neuromuscular Stabilization includes corrective exercises based in developmental kinesiology that activate the deep stabilizers to create coordinated co-activation of the entire stabilizing system by emphasizing proper breathing patterns during the exercises (Frank, Kobesova, Kolar, 2013). Clinicians practicing DNS also utilize reflex locomotion, awakening of intrinsic stabilizers and re-programming of movement patterns by activating developmental reflexes that have gone dormant since ontogenesis (Kobesova, Kolar, 2014).

Neuro-reprogramming has become an area of interest in my patient care. I realize that many of the techniques I utilize may have an underlying central mechanism, coming from the brain or spinal cord, which may not be fully understood. I feel that treating the central mechanism is the key to rapidly releasing old compensatory strategies and retraining the brain to use more efficient movement strategies. I would like to continue developing my knowledge and implementation of neuro-reprogramming tools, specifically to enact lasting change in my patients with motor control dysfunctions.

Researching the central mechanism has helped me better understand etiologies of pain and the mechanisms of interventions I was already using in my clinical practice. I believed I could make better intervention choices if I could understand the etiology of my patients' pain. When deciding how to supplement my knowledge I focused on the current scientific concepts of pain and Melzak's pain neuromatrix. In 1999, Melzak proposed the body-self neuromatrix, a neural network in the brain that integrates many inputs (e.g., sensory, visual, cognitive, instrinsic, stress-regulatory) and produces outputs (pain, sympathetic nervous system change) painting a picture of a multi-dimensional pain experience (Melzak, 1999).

Understanding the concept of a pain-processing framework made me more willing to adopt different clinical practices, such as psychosocial interventions. The pain framework directly affects the utility of any intervention choice I make. Sensorimotor implications, psychosocial strategies, cognitive characteristics, environmental, cultural, and socioeconomic effects are only a handful of factors that shape a person's pain processing framework, which paints the context around each

injury (Melzak, 1999). Patients most likely have some form of dysfunction in every category, but it is up to me, as the clinician, to determine the primary and secondary drivers (causes) and treat accordingly.

I believe one of the keys to determining which interventions are warranted, including the timing and order of those treatments, is valuing the patient's pain. For example, one reason athletic trainers (over)use electrical stimulation is predicated on the gate theory of pain control (Melzak, Wall, 1965). While the gate control theory brings the brain in to the pain equation, it fails to label it as more than a passive observer, a simple processor of nociceptive signaling. The neuromatrix model is more comprehensive and appreciates the function of the brain in pain processing. After studying the pain neuromatrix and gaining a better understanding the peripheral and central mechanisms of pain, I have now implemented psychosocial interventions into my practice. I better understand the multi-dimensional behavior of pain and the benefit of influencing its behavior in treatment. My goal when implementing psychosocial interventions is twofold: to down-regulate the sympathetic nervous system's involvement in the physical expression of symptoms, and to confront the patient's pain neuromatrix by addressing fears, past experiences, and factors influencing the patient's processing of symptoms.

The evolution of my patient care philosophy is largely due to the knowledge I gained from the DAT course curriculum and research , and the application of that knowledge on my patient care. In the residency portion of the DAT, I collected, analyzed, and reflected upon my patient outcomes. The residency allowed me to apply new knowledge, test and assess my application, and compare my outcomes with those

found in the literature. As each semester passed, I used lessons from the previous semester's residency, created goals for improvement, and incorporated steps to achieve better patient care and better understanding of my clinical reasoning.

Residency Findings and Outcomes Summary

Summer 2012 Semester

During the first summer session of the DAT there was no direct patient care, but the lessons I learned unequivocally influenced my return to patient care in the fall. The lessons presented in first weeks of the program were exceptionally influential to me and provided me with the foundation I needed to enact change in my clinical residency. Prior to entering the DAT, I felt confident in my clinical ability to evaluate and diagnose under the biomedical model and to make treatment decisions based on tissue healing time frames, the inflammatory process, and the individual needs of the patient. The first summer session, however, highlighted what I did not know. I was challenged in a way that I had never experienced. One such challenge came in the form of a reading assignment, "Developing Scholarship in Athletic Training" (Knight & Ingersoll, 1998). Knight and Ingersoll presented the topic of scholarship and how it is essential to the growth and survival of the AT profession. Knight and Ingersoll defined knowledge, truth, and theory as they compile and share attributes of a scholar. More importantly, the article motivated me to reflect upon my current attitude of knowledge and truth. I came to the conclusion that I had not been as open to change as I could be which is demonstrated in an excerpt from my first reflection in the DAT on the article from July 5, 2012:

> *While I consider myself to be open-minded, I know that I have biases. I now understand that the amount of knowledge I have is teeny tiny. For this reason I*

> *tend to cling to it tightly and require significant proof and consistent pushing to change or meld it into something different (a nice way to say that if you are going to try to tell me that what I thought was right was actually wrong, you better come fully armed and ready to go toe-to-toe in order to change my mind). Admitting the problem is the first step to recovery: In the pursuit of scholarly attributes I cannot be only willing to hear the alternatives, but to take them as the new truth and implement them into my practice. Whether I ever attain scholarship status is irrelevant because the journey itself will make me the best practitioner I can be.*

I concluded that it was my duty to challenge the assumptions that I make and to look past what I think I see and what I have learned in the past. I had to recognize my biases before I could make any change in my patient care. I decided that if I was to fully commit to the DAT program, I was going to have to challenge my biases and my choices. I had to take the responsibility of learning on myself, instead of relying on others to teach me or relying on my past education to carry me through my career. I was humbled to take such a responsibility upon myself and, in honest reflection, felt unready for such a challenge.

Goals for the Fall 2012 Semester

My goals going in to Fall 2012 stemmed from the readings and class discussions from the summer session. I was introduced to the concept and significance of patient outcomes for the first time through several readings and I gained a better understanding of disablement models (McLeod, Snyder, Parsons, Bay, Michener, and Sauers, 2008; Hurley, Denegar, Hertel, 2011). The disablement models I chose would make the measures I was attempting to quantify more valid and reliable, as well as easier and more efficient to implement. McLeod et. Al (2008) outlined different models and explored how disablement models might become part of the foundation for enabling EBP in AT. My implementation of disablement models would help produce the

bidirectional flow of information that outcome assessments create in translational research (McLeod, Snyder, Parsons, Bay, Michener, Sauers, 2008). The objective of translational research is to provide the connection between the laboratory setting and current clinical practice and clinical practice to the laboratory. Open communication in the form of research, both from the researcher to practitioner and from practitioner to researcher, helps create best clinical practices by ensuring effective use of laboratory findings in real world settings.

I accepted that outcomes, data, measurements, and analysis had all been missing from my patient care. Even when working under an orthopedic surgeon, with high expectations for correct and thorough documentation, disablement models and patient outcomes were never discussed. I knew that if I could not determine with certainty that the interventions I was prescribing were working, I might learn new skills, read new studies, practice new interventions, and, potentially, never improve my patient care.

One of my goals going into the Fall 2012 was to determine the efficiency of my treatments by collecting and analyzing patient outcomes of treatment. I planned to implement the Disablement in the Physically Active (DPA) Scale, at regular intervals during treatment, to gain a better understanding of my patient's perceived ability or disability in four main categories: impairments, functional limitations, disability, and quality of life (Vela & Denegar, 2011). My second goal was to prescribe one treatment at a time, avoiding the "shot-gun" approach of treatment with every tool possible, in the hopes that one might work. Using one treatment at a time would help me to assess each intervention singularly. Lastly, I wanted to develop an evaluation protocol that

was more inclusive of the regional interdependence paradigm, with less reliance on the biomedical model. My initial goals, while broad, demonstrated reflection, implementation of new information, and open-mindedness. I was motivated to expand my knowledge, instead of protecting my personal interpretation of information and demonstrated scholarly attributes and characteristics (Knight, Ingersoll, 1998).

Fall 2012 Semester Results and Discussion

I began the DAT comfortable using several manual therapy interventions, but had never assessed their utility, or my ability in using each intervention in practice. Returning to clinical practice in the Fall 2012, I had a chance to start critically analyzing my practice. The sheer numbers of patients for whom I was responsible made it intimidating to consider collecting data. I began by experimenting with a new technique, exploring the McConnell fascial unloading technique, and collecting evidence with my outcomes of PRT. I also attempted to use the DPA Scale on all of my patients complaining of musculoskeletal pain, at their initial evaluation and one time each week until discharge.

The McConnell fascial unloading technique, presented to us by a second-year DAT student in the summer, was a taping application to unload the fascial tissue in the area of the hamstring muscle belly. I hypothesized that I could utilize the technique for the treatment of any minor fascial injury, not only injuries in the posterior thigh. In the first few weeks of Fall 2012, I had four cases of first-degree muscle strains in varying locations: distal adductor, vastus medialis, proximal quadriceps, and paraspinals. Each patient presented with localized point tenderness, pain without a loss of strength with manual muscle testing, and full range of motion (ROM) with pain at end range. I asked

each patient to identify a functional movement that would aggravate their pain. I applied the tape, changing the tension, angle, shape, and location for each patient to best unload the fascia of the involved area. The patients would then reload their tissue by performing their aggravating functional movement. All four patients experienced full resolution of their symptoms on day one and were able to return to activity without restriction the same day.

I began studying PRT just two months before starting the DAT, so I had limited clinical experience with the technique. The nature of PRT as an indirect technique seems counterintuitive to traditional manual therapies that evoke pain during treatment (e.g., Active Release Technique, Rolfing, Instrument Assisted Soft Tissue Mobilization). I found I felt comfortable using an indirect intervention, especially for patients with very active TPs. One patient I treated successfully with PRT was a 22 year-old right-handed baseball pitcher with lateral elbow pain. While throwing during a game 2weeks earlier, he had experienced posterior and lateral elbow pain and removed himself from the game. At the time of my assessment, he complained of pain posteriorly and, most significantly, at his radiohumeral joint. He was also tender to palpation medially, along his flexor bundle. He noted that he had residual tightness from a previous flexor strain he had suffered over a year earlier. He displayed noticeable extension loss and was unable to extend without pain, passively or actively. The first day of treatment consisted of PRT to release TPs at the flexor/pronator musculotendinous junction (MTJ) and bicipital aponeurosis. He reported a resolution of his flexor tightness for the first time since his initial strain and that he “felt great,” but stated he needed to throw to make sure. After throwing the next day, he reported

not having any pain, but admitted to being "careful." I re-examined for TPs and found one that elicited his first jump sign (an indication to prioritize treatment of the area), located about 1/3 the distance of his forearm distally, along his medial ulnar border. I treated the TP with PRT. After treatment, he gained 8° of elbow extension and, when compared bilaterally, had full pain-free elbow extension since his initial injury. He could not find a position or motion that elicited his pain. On Day 3, the patient had maintained half of the extension that was gained with PRT, had thrown without pain or stiffness, and did not present with a return of any of the previously treated TPs in the next 30 days while under my care.

I shared the previously mentioned cases in two blogs entitled: "Thoughts Upon Returning," August 6, 2012, and "Were not in Kansas Anymore," August 17, 2012. My anecdotal case series of the fascial unloading tape application and the case of lateral epicondylar pain treated with PRT were far from ideal examples of outcomes collection, but each situation provided exceptional learning points. I did not collect pain data using the Numerical Rating Scale (NRS) or patient-oriented evidence using an outcomes instrument (e.g., DPA Scale) to allow for in-depth assessment of my outcomes in any of my cases. I learned that, although I could reflect on the patient cases and find personal meaning, I could not create any clinical meaning without evidence. In the case of the baseball player with lateral elbow pain, I also fell short of collecting data prior to providing treatment. I had not formulated a plan before starting treatment with the patients, so I was unable to determine the effectiveness of the interventions across all of the relevant variables of patient care.

At the time, I was more focused on the clinical application of the technique than

the clinical implications of the technique. With reflection, I decided that I needed to be more purposeful in my evaluation and documentation if I wanted to create evidence supporting the therapeutic effects of my intervention choices and application. I devised a 6 step plan for my initial evaluation appointments with new patients that included: 1) Otaining an initial DPA Scale, 2) Identifying primary, secondary, tertiary complaints, 3) Documenting relevant data such as NRS and specific goniometric measurements, 4) Completing the SFMA and breakouts 5) Determining an outcome measure to utilize that is specific to the patient's complaint or limitation, 6) Performing an initial treatment for the patient's primary complaint and collecting post treatment measurements.

After implementing a specific plan for collecting pre-treatment outcomes, I was able to perform data collection with much more success. One case that exemplified the change was Patient 101, an 18 year-old basketball player who reported with left hip and low back pain. He first began experiencing pain 2 months prior to reporting in the clinic after falling from a moving golf cart onto a concrete surface, landing on his left buttock and hip. His primary complaint was pain with most ranges of motion, as well as sitting for long periods and any rapid movements. I performed a postural assessment of his pelvic alignment with the March Test, Forward Bend, and active and passive SLR in supine. The patient displayed a visibly posteriorly rotated left ilium in standing that was accentuated during the Forward Bend and March tests. The patient had a positive active straight leg raise (SLR) with 52° of right hip flexion, with pain over the left SI joint Passive SLR was pain-free through full ROM compared bilaterally. Slump test was also positive in the initial thoracic/lumbar slouch positions without

added cervical flexion. Muscle testing of the psoas, iliacus, and deep spinal stabilizers was performed with slight weakness against resistance. He reported a DPA Scale score of 37 at the time of the initial assessment. He reported his pain was a 5/10 at worst and a 0/10 at best.

I began my evaluation with the McKenzie MDT methodology because I was unsure of the influence the spine might be having on his symptoms. The findings of the MDT screening were inconclusive, so I moved on to the SFMA. I performed an SFMA and discovered core and active hip flexion stability and/or motor control dysfunction (SMCD).

Treatment 1 was a lumbo-pelvic MET mobilization to restore positioning of his posteriorly rotated ilium. After treatment, he was pain-free and his active SLR increased to 61°. I taught the patient a self-mobilization that he could do throughout the day and asked that he complete the treatment at least 3 times daily, or with any return of his symptoms. The patient returned 3 days later with active SLR ROM increased to 65° (Chart 1). After myofascial decompression of his anterior hip, he further increased his active SLR to 74°.

Due to his newfound pelvic positioning and increased ROM, I felt it important to prescribe him a pelvic girdle stabilization exercise program. I was able to see him again ten days later. He did not report any pain with daily activities. His active SLR was 68° and increased to 83° after being treated by the team chiropractor with lumbar and left sacroiliac mobilizations. A week following chiropractic adjustment, after continuing with his home program, he was able to return to practicing with the team without any pain. His DPA Scale had decreased to a score of 10 (Chart 2) and he was able to

perform the SFMA movements without displaying dysfunction.

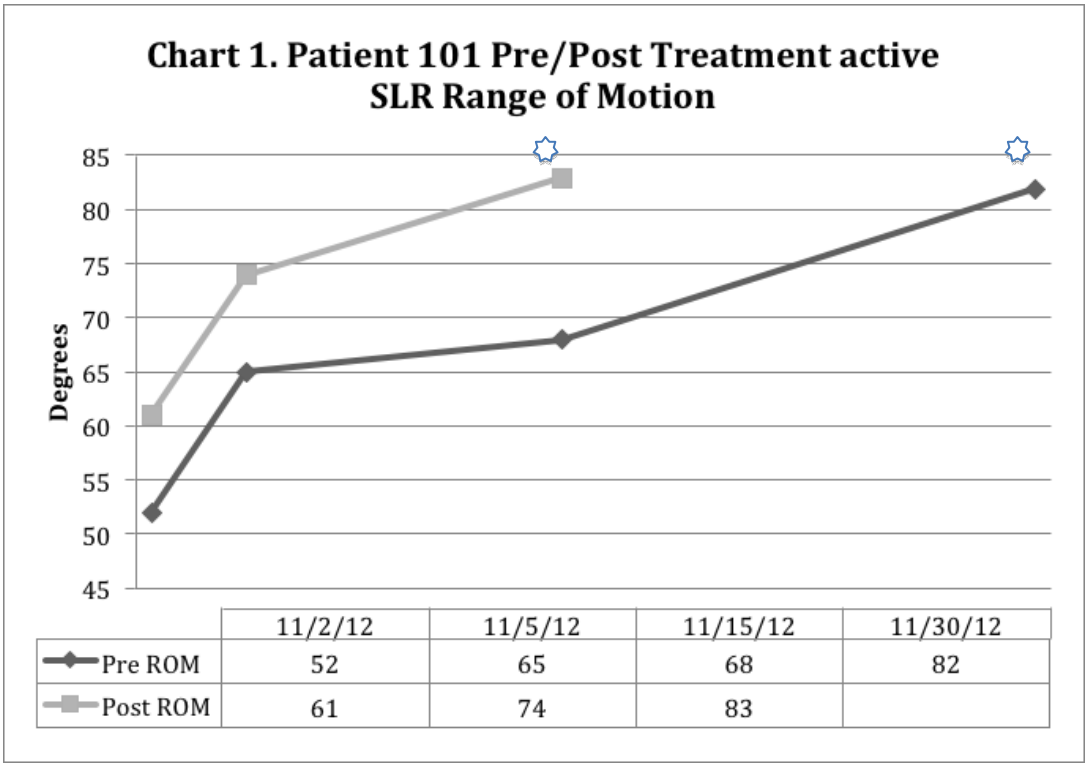


Chart 1. Asterix (*) denotes range of motion returned to within normal limits.

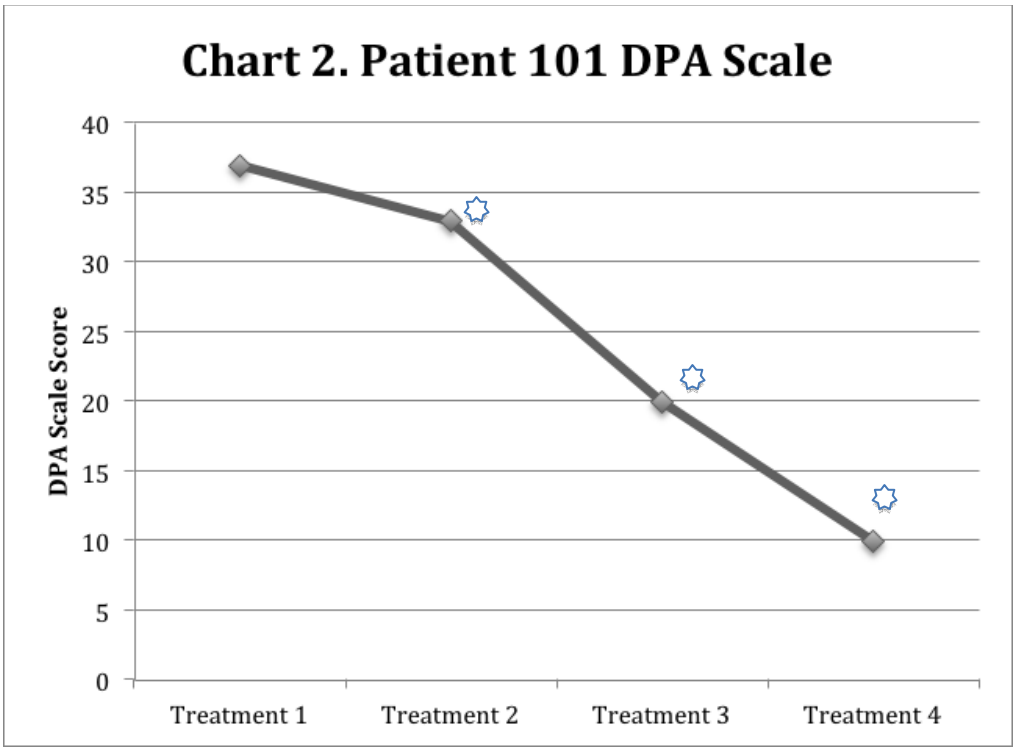
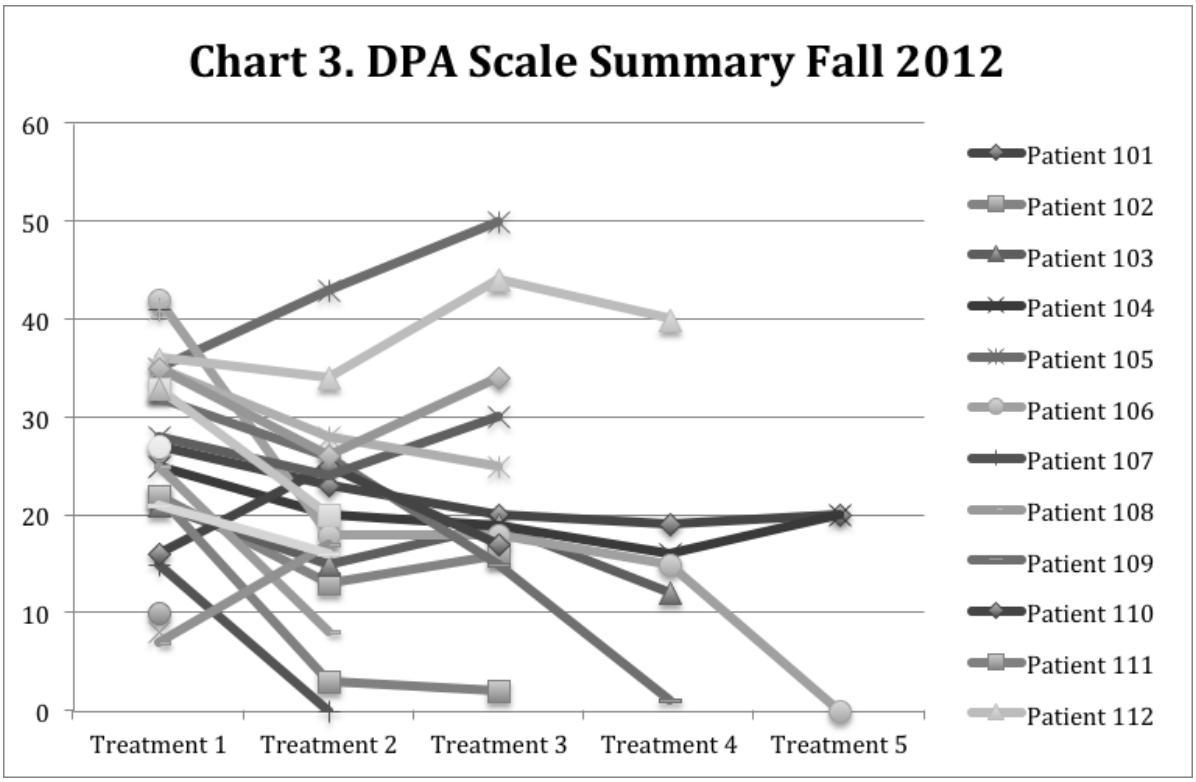


Chart 2. Asterix (*) denotes a minimally clinically important difference in DPA Scale score.

Patient 101's case represents a successful clinical intervention, but also improved outcomes collection, and successful implementation of my plan for initial evaluation procedures. I was able to perform the SFMA, collect ROM measurements before and after each treatment session, and be consistent collecting a DPA Scale score. During the Fall 2012 semester, I collected data from a total of 50 patients: 27 with acute complaints, 17 chronic complaints, and 6 illnesses. Of the 44 patients with musculoskeletal complaints, I was able to collect DPA Scale data on 24 (Chart 3).



Of the 24 patients with DPA Scale data, only 15 of them had more than a single DPA Scale recorded. Of the 80% (*n=12*) of the patients who experienced a decrease in their DPA Scale initially, 42% (*n=5*) subsequently experienced an increase. Only one patient ultimately reached a zero score. Overall, I was not happy with these results for two main reasons. Firstly, my interventions were not as effective as I had thought. Almost half of the patients who did have a decrease in DPA Scale had an increase thereafter, which could be due to several things: my initial diagnoses were incorrect, I was not choosing the correct interventions, I was not correctly utilizing the interventions, or there were other elements effecting patient cases that I was not addressing. Secondly, I felt that the data I collected was not complete. I did not feel that I was getting a true picture of my patient care because I did not collect complete data on more than half of my patients.

Goals for the Spring 2013 Semester

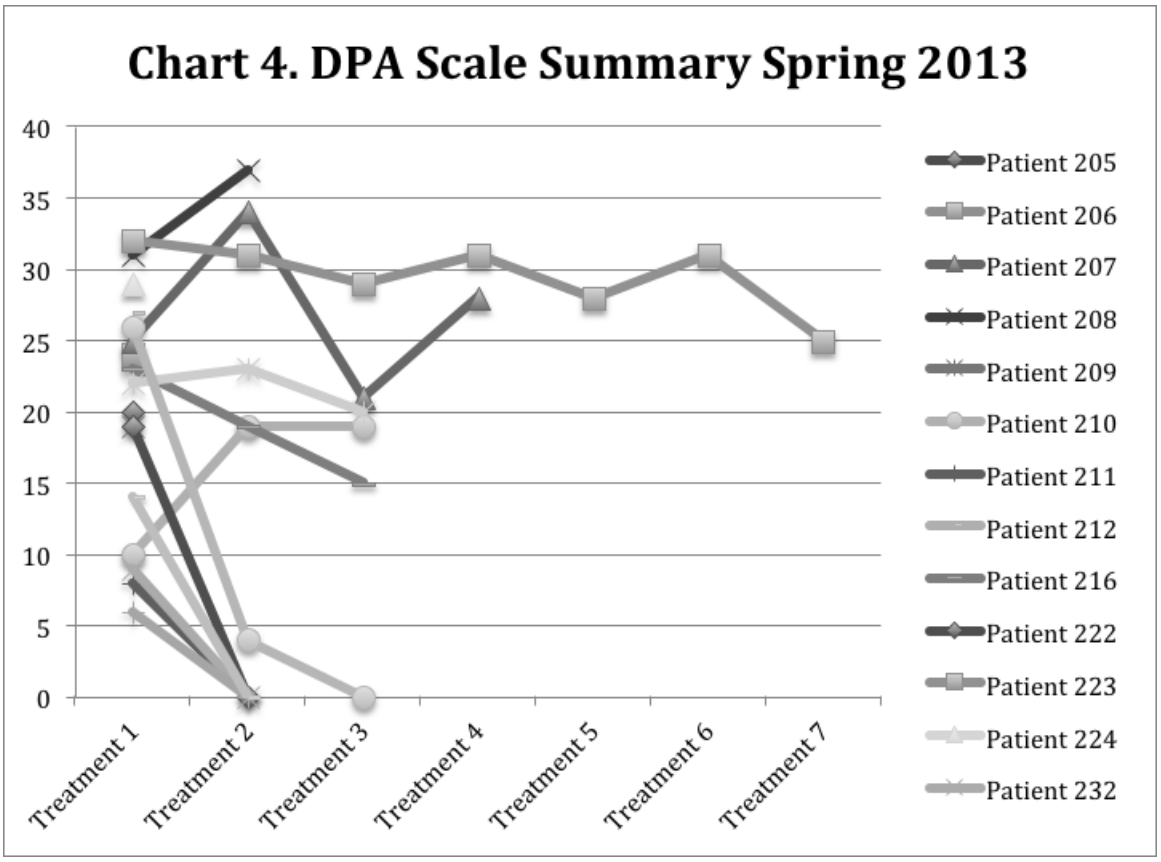
Moving forward to the spring semester, I wanted to continue collecting outcomes data and create more meaningful clinical reflection. My initial attempts at data collection were disorganized due to poor planning and being intimidated by the process. In contrast, I was fearless in implementing the new techniques. I was not afraid to attempt an intervention I had not tried before, or experiment with my patients, but I was afraid of collecting evidence of intervention results. To produce information with any depth, however, I needed to be more focused and consistent in my efforts to collect global outcomes and identify patient and clinician centered goals.

Spring 2013 Semester Results and Discussion

In the Spring 2013 semester, I treated a total of 56 patients in the AT clinic. I collected data on 40 patients, but decided to implement exclusion criteria to get a more accurate glimpse of my direct patient care. I chose to exclude 5 patients who were treated by AT students, under my direct supervision or the supervision of another AT. I excluded an additional 5 patients who discontinued their treatment because they were either cut from their team or transferred to another university. I excluded 3 patients due to non-compliance issues, 2 patients who complained of general medical problems, and 1 that did not receive consistent care because I was traveling with another team. A total of 16 patients were excluded accounting for 40% of the global outcomes that I had collected, which left 24 patient data sets (Chart 4).

Of the 24 patients, I collected DPA Scale data on 13. Patient 223 was a soccer player suffering from post-concussion syndrome, which I inherited from a frustrated colleague. Patient 223 could be considered an outlier, because she was not suffering

from neuromusculoskeletal pathology, and was being treated by a neuropsychologist. I included her outcomes because I was treating her main complaint, anxiety, with psychosocial interventions. Without her data included, the DPA Scale decreased in 75% (*n=9*) of the patients after the first treatment, with no patients experiencing a subsequent increase on the next treatment. Some patients did experience an initial increase in DPA Scale (33%, *n=4*), but several patients reached a 0 DPA Scale score (50%, *n=6*).



The negative trend of Chart 4, compared to Chart 3, illustrates positive patient outcomes. The efficacy of my intervention choices and application, coupled with the

purposeful collection and analysis of outcomes data created is illustrated by the change in my outcomes. In Fall 2012, I was only able to resolve one patient's DPA Scale scores to 0 (6% of patients), but achieved a 0 DPA Scale score for 6 patients in the spring (50% of patients). In the Fall 2012 semester I was able to achieve initial decreases in DPA Score with 80% of my patients, but almost half of them (42%) subsequently increased. In the Spring 2013 semester I achieved initial decreases in 75% of my patients, and none saw a subsequent increase.

To address the weaknesses of my practice and outcomes collection identified in Fall 2012, I began completing more focused reflections of patient cases and attempting to group my patients into classifications. An example of my patient reflections is in the case of 5 patients who all reported to the clinic at different times complaining of knee pain (Table 1). The reflections were valuable because I was able to see the qualitative data I had created about my decision-making process alongside the patients' outcomes of treatment. I identified several patterns in my patient care by reflecting this way: 1) I made decisions based on the time constraints I had with each patient, 2) I continued to deepen my understanding of new interventions and was able to see how I would choose to implement a different treatment, and 3) I was able to identify the value of treatments I had not yet learned and saw a need in my patient care for additional paradigms/intervention strategies.

Patient ID	Reflection
217	"It should not take me 8 days to figure out that someone's IT band tightness is causing lateral knee pain. Especially because I have seen this before in patients with the very same complaint, and similar characteristics. Also knowing the patient's history with low back problems, I have seen a clear pattern in other low back pain patients having tight external hip rotators and tight IT bands, that can sometimes cause painful knees."
218	"Patient complained of very similar issues when compared to a previous patient. I was able to make the connection sooner and ask her to roll out her IT band to see if that helped. It did very much, enough that she added it to her daily cool-down routine and has not had problems since."
224	"This is yet another patient that I would have done some different things. Firstly, it took me until the third treatment to be able to SFMA her- this is a problem. Although I feel I reached the same conclusion, I should have done this at the start. Further, I am not sure the IASTM was warranted for this patient. I might have tried TMR first because much of her dysfunction was muscular.- as shown by the significant changes elicited with muscle energies. Looking back I do not believe the fascia played a large role and if I were to see the same patient again, I would not jump right to that as the course of treatment."
225	"With this patient, it is clear that I was looking for a quick fix. Because she was a key player and we were in the heat of conference play, there was not much time to dedicate to treating her (much of the problem came with her school schedule being very demanding and not having time to come in for treatment). I am disappointed in myself looking back on this patient for many reasons: 1) Por documentation. I was clearly rushed and did not take the time to note each encounter with her, and the ones that I did put down are of very poor quality. 2) I did not take the time to run her through the SFMA, nor did I record global outcome measures. 3) There is very little clinical reasoning going on with this patient. It seems as if I was stumbling around in the dark just trying to find what might work to get her to be pain free long enough to practice or play. Even with the McConnell taping, the reasoning was that nothing else we were doing was working, and her pain was mostly medial- in an attempt to decrease pull or stress on that area I tried the taping technique on a whim. It performed very well and after 4 days of wearing the tape she was actually completely pain free. She sustained this change through the last 5 games (while continuing with the rehab protocol). Her pain returned only after her season had ended and she was not coming in to rehab or get any treatment. Was there a positional fault? Possibly caused by her systemic hypermobility? Over all I am very disappointed in the course of treatment for this patient."
238	"This patient was a perfect example of a MDT dysfunction. It was really fun being able to try something new and have it work so profoundly. The patient was also surprised by the results. She did not have any other com- plaints and did not feel the crunching any longer throughout the rest of season."

Table 1. Sampling of Spring 2013 reflections; patients complaining of knee pain.

Even though my patient outcomes were displaying change, I felt the change was slower than what I considered necessary to achieve my goals in the DAT. In several blog posts I referenced my overwhelming workload and my struggle to find the time I needed to reflect on patient cases and invest in my DAT work. I was not reaching my potential and I needed to be honest about my limitations. During the Spring 2013 semester, I also began seriously researching clinical reasoning and decided to make it an area of focus on my path to advanced practice. An excerpt from a blog post entitled "Musings of a Reflective Noob", February 23, 2013, illustrates that I was starting to understand the importance of identifying the limitations of my context.

> *In a previous journal entry about the DAT early last semester I lamented that the process for each of us is in and of itself action research, not simply an avenue for learning action research, but a way to partake in it without having any knowledge of the fact. We are the experiment. Stepping into the classroom day one I had no idea what I was getting myself into. I did not think I was going to understand most of it. It has now hit home with such an incredible force, because the topic resonated with a deep internal struggle I didn't (and still don't) fully understand how to articulate even to myself. So much of this program for me is attempting to recognize and deeply understand every facet of what I believe; how it feels to me, what I choose to do with it, when and why and how I explain it to others, etc. All the while knowing that it is a living thing, ever changing, impossible to predict a year from now, and dependent on context. It is the task of defining and verbalizing what I believe in my own context (after recognizing that I live in a context unique only to myself), then being able to relay it to others in a way they may understand and relate to through their unique context, that will help me cement my truth before it inevitably like sand through my fingers turns into something new.*

I recognized that I was making decisions in my professional life that were hindering my clinical growth and kept me from fulfilling my goals in the DAT. I was not performing to the standard I set for myself and needed to make a drastic change to redirect my path. I decided to leave the university clinical setting and pursue a new

avenue in education that would foster my professional growth and provide me with more mentorship and accountability.

Goals for the Fall 2013 Semester

My goals for Fall 2013 were to change my context by changing jobs, streamline the organization of my data, and commit to more consistency in my data collection and reflection.

Fall 2013 Results and Discussion

I began the Fall 2013 semester with a blank slate. I had just started a new job, was putting aside regular time for my coursework, and found the time I needed to appropriately reflect on my patient care. The depth of my understanding of the techniques I had been studying increased exponentially, as did my ability to use them in my patient care. To illustrate change, three patient cases of increasing complexity are described.

The first patient, Patient 302, was an AT student presenting with constant pain in the eyes and sub-occipital region. She went to bed the night before with a headache and woke up in the same amount of pain. She could not remember any external force mechanism, did not complain of aura, or report having a history of migraines. Upon examination, she was only slightly limited in her active cervical ROM and complained of some general stiffness. She had some tenderness throughout the sub-occipital region without directional preference (i.e., right or left side) and her pain increased with continued palpation. I applied the Mulligan headache sustained natural apophyseal glide (SNAG) for twenty seconds. The patient's pain decreased from a 7/10 on the NRS to a 4/10 in a single treatment (Chart 5). As she was in between classes, she was not

able to stay for another treatment. The following day, she reported that her pain had continued to subside throughout the rest of the day until she was pain free. One month later she reported no recurrence of those headache symptoms.

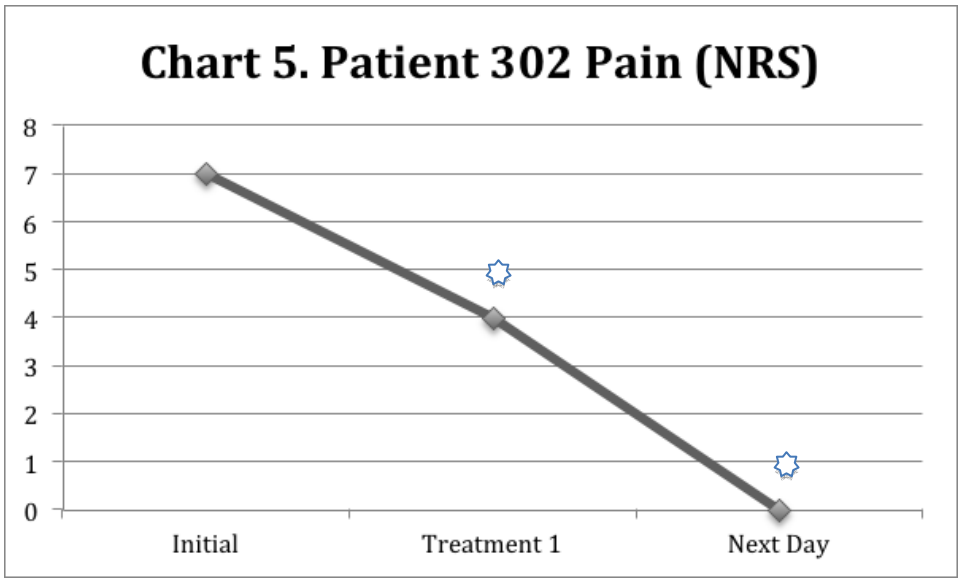


Chart 3. Asterix (*) denotes a minimally clinically important different for the NRS.

I was happy with the outcome for Patient 302, though I was disappointed that I did not have enough time to perform a second set of SNAGs. With a 43% decrease in her pain following a 20 second treatment, I was fully confident that additional treatments would abolish her pain during that treatment session. I was happy to hear her pain continued to decrease throughout the day and that she was pain free the following day. I believe this is a good representation of how effective treatment can be if the correct classification is made and an appropriate intervention is applied in a timely fashion.

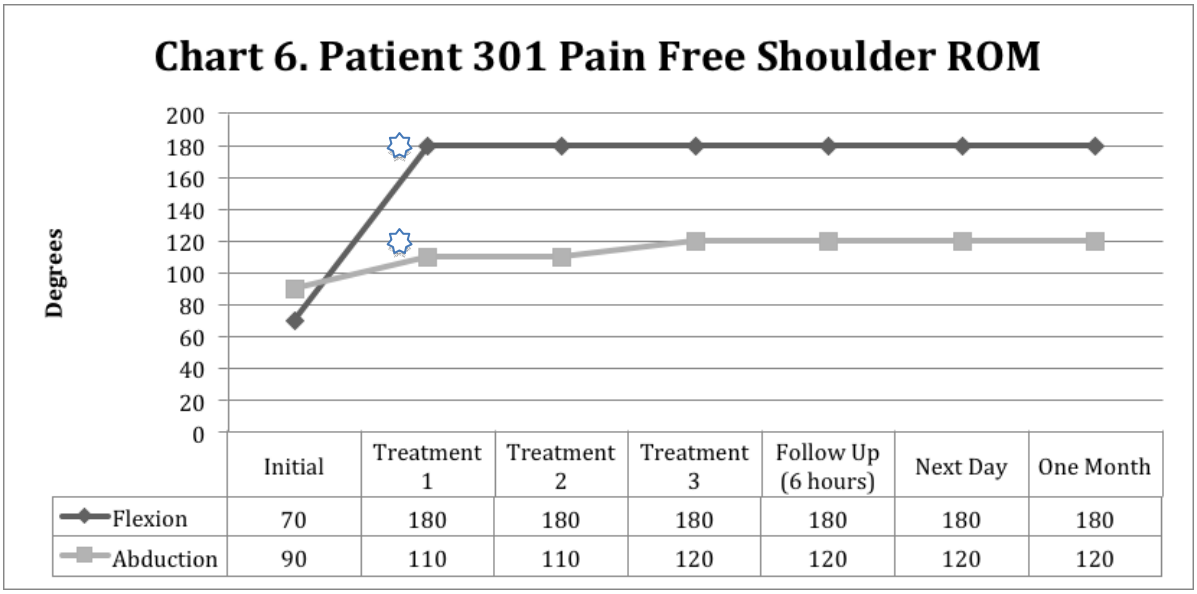
Prior to the DAT, I would not have been equipped to effectively classify and treat patients presenting with headache symptoms. During the summer 2013 semester I had an opportunity to observe another clinician treat a patient with migraine headaches and felt unprepared to do so myself. I looked to the literature to learn more about evaluation and treatment of migraines and cervicogenic headaches. Jull, Bullock-Saxton, and Darnell (2007) reported the collective presence of restricted movement, palpable upper cervical joint pain, and impairment of the cranio-cervical flexion test is 100% sensitive and 94% specific to identify a cervicogenic headache ($P<.001$). The same impairments were not found in patients suffering from migraine or tension type headaches. With this new information, I felt much more capable to differentially diagnosing headaches. I believed Patient 302's headache was cervicogenic for four reasons: 1) No history of migraine symptoms, 2) Her symptoms were present from suboccipital region to eyes, 3) Palpation increased her headache pain, 4) Pain was not throbbing. All of these are major criteria set forth by the Cervicogenic Headache International Study Group (Sjaastad, Fredriksen, Pfaffenrath, 1998).

I chose to perform a Mulligan SNAG over PRT, which could have been warranted given her suboccipital tenderness, because there was no directional preference to her tenderness when compared bilaterally. Additionally, the TP pain with palpation was not 2 times more severe when compared to the surrounding tissues, which would have been an indicator for treatment with PRT . With more diffuse tenderness, I suspected the cause to be poor resting joint position. I also believed TPs may have arisen that would need releasing in order for the joint mobilization to be long lasting had her positional fault not been addressed.

A single efficacy study has been performed on the self-sustained C1-C2 SNAG. Researchers took a sample of 32 subjects and randomly placed them in treatment (self-SNAG C1-C2 applied twice daily) or placebo groups. After 4 weeks, the treatment group reported significantly lower headache index scores than that of the placebo with an overall 54% greater reduction (Hall, Chan, Christensen, Odenthal, Wells and Robinson, 2007). I found it interesting that the measurements were taken so far apart, seeing as the effects of the Mulligan Concept mobilizations should be profound, immediate, and long lasting (Mulligan, 2004). Compared to this study, my patient experienced a more rapid resolution of pain and did so in less than 12 hours from a single clinician applied SNAG. Upon follow up one month later, she had not had any recurrence of headache. I was very happy with the outcome, as was my patient.

I experienced another influential interaction with Patient 301, a 43 year-old hockey player who had experienced 11 months of right shoulder pain following a violent check into the boards. He remembered experiencing a few days of intense pain immediately following the injury, but this pain decreased slowly with rest and ibuprofen. He did not seek any other evaluation or treatment and reported that while his pain had decreased in intensity, it had not subsided and had been constant since the initial incident. He was hesitant with his ROM and was limited due to pain. He experienced pain 6/10 (NRS) with 70° of forward shoulder flexion, pain 6/10 with 90° of abduction, and pain 2/10 at rest. Upon palpation, he had several point tender areas throughout the shoulder including pectoralis major and minor, supraspinatus, infraspinatus, upper trapezius, and posterior capsule. I conducted a biomedical exam and found minor posterior laxity, positive crepitation with active compression and

rotation, but neither test increased his pain. I believed that he most likely suffered a labral tear, but that the tissue healing time frame had passed and he was no longer in an inflamed state. Based on my findings, I concluded that his CNS was causing guarding of the joint, resulting in restricted joint motion, and I began treating with TMR.



	Initial	Treatment 1	Treatment 2	Treatment 3	Follow Up (6 hours)	Next Day	One Month
Flexion	70	180	180	180	180	180	180
Abduction	90	110	110	120	120	120	120

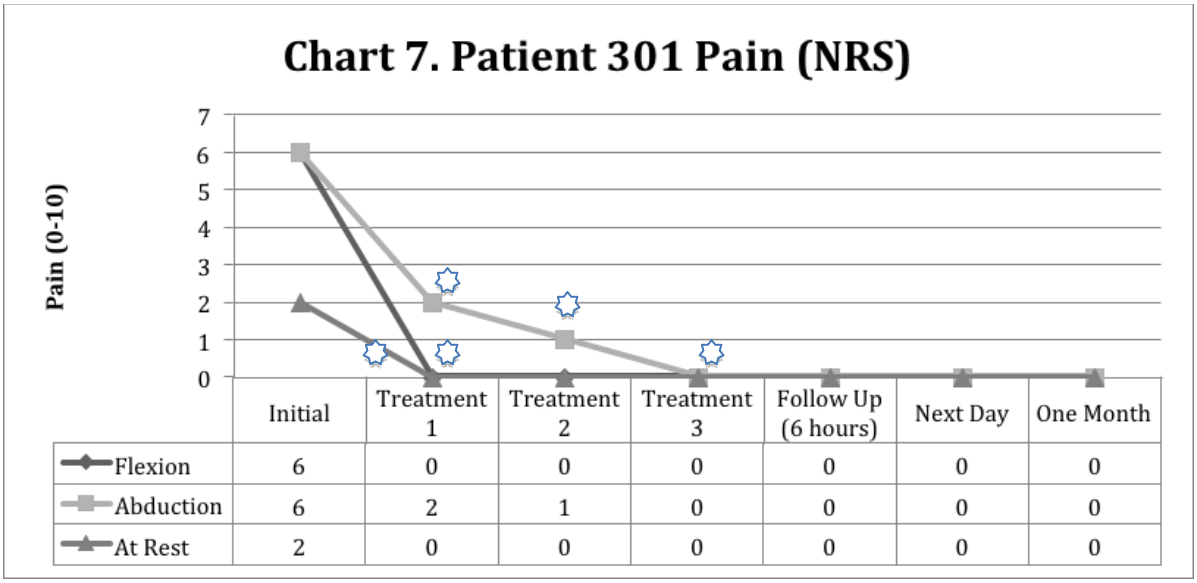
Chart 6. Asterix (*) denotes within normal limits range of motion.

The patient's pain free range of motion (Chart 6) changed immediately from 90° of abduction and 70° of flexion, to 110° and 180° respectively, with a single round of TMR treatment. Subsequent repetitions of the TMR movements did not elicit any additional gains. I decided to incorporate a mechanical glide and the patient gained an additional 10° of abduction. The patient's NRS scores (Chart 7) decreased to 0/10 with flexion or at rest, and to a 2/10 with abduction. Pain with abduction further decreased (1/10) with an additional round of TMR. With the application of the final mechanical technique, the patient's pain in all motions and at rest was abolished and remained that

way through the following day. One month later, he reported maintaining the pain-free motion.

The key facets of Patient 301's case presentation that led me to my initial treatment choice of TMR were: 1) The tissue healing time frame for labral tear was long past and provocation tests to the labrum were not painful, indicating there was no inflammatory process occurring in the labral tissue, 2) Tests for posterior stability were more lax on the right, compared bilaterally. Posterior stability of the shoulder is not stressed during activities of daily living unless they include simultaneous flexion, adduction, and internal rotation of the shoulder. Posterior translation is dynamically resisted by the supraspinatus, which may explain his tenderness there (Tannenbaum and Sekiya, 2011), 3) Because of the duration of his pain, almost a year, he most likely developed compensatory patterns, and 4) The compensatory movement patterns were most likely causing the current pain, not the labral lesion.

I believed the initial plateau in the patient's improvement was due to the mechanical deformation of tissue in the labrum. Using the concepts of MDT and Mulligan, I decided to attempt move the deformed labral tissue to a better resting position by manipulating the joint while the patient performed active movement in the opposite direction of his aggravating motion. I then educated the patient to avoid movements that would oppose the natural resting position of the lesion.



	Initial	Treatment 1	Treatment 2	Treatment 3	Follow Up (6 hours)	Next Day	One Month
Flexion	6	0	0	0	0	0	0
Abduction	6	2	1	0	0	0	0
At Rest	2	0	0	0	0	0	0

Chart 7. Asterix (*) denotes minimally clinically important difference for the NRS.

Dr. Tom Dalanzo-Baker's TMR has a myriad of anecdotal evidence of patient outcomes, including reduction in pain, increased strength, and increased ROM. Minimal research, however, has been published on the actual practice of the technique. The theory of the technique is grounded in the neurological study of cross-education (Munn, 2000; Uh, 2000; Pink, 1981), and more recently the application of fluid dynamics theory in physics to the fascial system (Schleip, 2003). Dr. Dalanzo-Baker shares several video testimonials of patients whose years of pain were resolved in one treatment. Comparatively, my results were equally profound. I am still amazed at the ease and speed of this treatment, along with the ability of patients to learn to self-treat. I was unable to get a DPA Scale on this patient because I was treating him outside of a clinical setting and I do not feel the absence of a DPA Scale score hindered my evaluation. Without a DPAS, however, I limited in my ability to assess my overall effectiveness and to compare this patient's outcome to others. Ultimately, I was happy

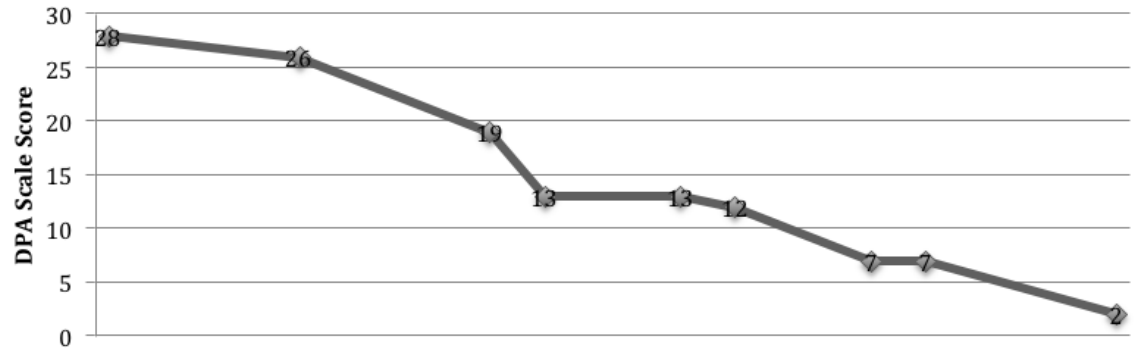
with the outcome, especially incorporating two different paradigms in the same treatment session.

Patient 304 represents my most complex patient case of Fall 2013 semester and is a good example of my clinical growth. An 18 year old male college freshman with chronic patellar dislocation, due to bilateral trochlear dysplasia, presented to the clinic after complications following right trochleoplasty and surgical restoration of the medial patellofemoral ligament 3 years prior (Dec, 2009). Due to the procedure, he was unable to participate in his sport activities (i.e., baseball and football). While jump roping, four weeks after the initial surgery to his right knee, he sustained a patellar fracture. Two screws and a length of wire were used to repair the patella. Patient 304 suffered from chronic swelling and bursal irritation, so the wire was removed 3 years and 8 months after the patellar repair.

He reported to the clinic 4 weeks after the wire removal procedure. Examination revealed major atrophy of the right thigh musculature compared bilaterally. The patient did not report tenderness to palpation, but the patient rated his pain 4/10 on the NRS at the end range of his available active knee flexion (127°) and reported pain 7/10 with activity. Neurological screening was normal for strength and sensation, except for a small area of paresthesia immediately surrounding the surgical scar, which is to be expected. The remainder of the patho-anatomical exam was otherwise unremarkable. The Selective Functional Movement Screen (SFMA) was performed, and indicated: spinal weight bearing stability or motor control dysfunction, thoracic extension stability or motor control dysfunction, right knee joint mobility or

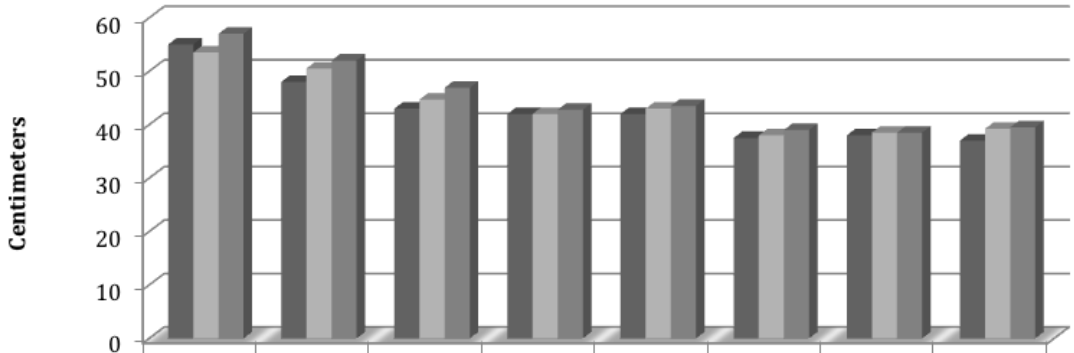
tissue extensibility dysfunction, and proprioceptive deficit at the right ankle. I also collected DPA Scale scores (Chart 8) and girth measurements (Chart 9).

Chart 8. Patient 304 DPA Scale Scores



	9/10/13	9/17/13	9/24/13	9/26/13	10/1/13	10/3/13	10/8/13	10/10/13	10/17/13
Patient 304	28	26	19	13	13	12	7	7	2

Chart 9. Patient 304 Girth by Location (cm)



	8	6	4	2	0	-2	-4	-8
9/10/13	55	48	43	42	42	37.5	38	37
9/24/13	53.5	50.5	44.7	42	43	38	38.5	39.2
10/8/13	57	52	46.9	42.8	43.5	39	38.5	39.5

Due to the complex case presentation, I chose to implement several paradigms to create an integrated plan to address the different needs of the patient. Treatment included Mulligan Concept mobilization with movement, core motor control training, instrument assisted soft tissue mobilization, and psychosocial interventions. Full restoration of function was achieved over 4 weeks and total of 7 treatments. The patient's DPA scale decreased from 28 to 2, and the patient gained a total of 10.5 cm of girth (Appendix 2).

Trochlear dysplasia is rare and considered to be an underdiagnosed cause of recurrent patellar dislocation, especially in children and adolescents. Treatment is usually surgical to restore the trochlear grove. Surgical reconstruction of the medial patellofemoral ligaments is also recommended in cases which medial knee stability has been compromised (Farr and Gomoll, 2014). In this case, the subsequent patellar fracture further complicated the case. As incidence rates of patellar fracture after surgeries are not documented in the literature, it is plausible to consider it a rare occurrence. Patellar fracture should be considered a risk factor in patients undergoing medial patellofemoral reconstruction.

The SFMA is also not currently well established in the literature. Due to the lack of evidence surrounding the utility of the SFMA, its sensitivity is not known. The patient experienced full restoration of range of motion, strength, and function, was pain free and able to return to activity without limitations, suggesting the value of the SFMA as an evaluation tool and patient outcome measure.

Lastly, the clinical integration of several treatment paradigms sets this case apart from others. Each of the interventions I used had a specific purpose in the whole-

person care of this patient. Clinically, patients are seldom treated using a single intervention. The purposeful use of several treatment interventions differs significantly from the "shot-gun" approach of using several treatments in the hopes that one might help. An integrated approach, such as this one, is focused on the individual problems/dysfunctions of the patient and each intervention is evaluated through specific patient outcomes measures. I was happy with this patient case because I was able to see how a more complicated rehabilitation program can still integrate several philosophies to treat multiple goals. In this patient case, there were a number of goals and causes of dysfunction, and many ways to treat each. I do not believe that I would have been able to treat this patient 12 or even 6 months ago. The approach that I took was so integrated; it took a clear mind and clear goals to create. I did not have the mental capacity or clinical strategies I needed to produce these outcomes with this patient prior to the DAT.

Prior to the DAT, I also would not have had the interest, or the knowledge or skill needed, to assess characteristics of my clinical reasoning. I implemented additional outcomes to study my own clinical reasoning style within my patient care, so I could learn more about my decision-making and the elements that were influencing my patient care. An excerpt from a reflection that I wrote as part of the semester's coursework describes the transformation:

> *Old Lindsay would have been happy with treating patients with whatever her brain thought would be the best intervention. That is no longer the case. Now every time my processor shoots me out an idea I want to know its origin, the reasoning behind it, three possible outcomes of that idea, and if that idea is part of a pattern…this has been one of the best semesters for me in my patient care, not because of amazing outcomes or grand discoveries, but because I was actually able to slow down, focus, and think. Within my area of focus, clinical reasoning, this chance to stop running full steam has been what I consider to be the*

> *determining factor of my progress this semester. Being able to space out the time between patient visits, and make purposeful changes in the nature of the work I am doing between them, has given me the necessary time to actually think in-depth about each patient interaction and the facets therein. Before this semester I was very focused on the cause and effect relationships between my interventions and my outcomes. It was a want for more depth of understanding that drove me to choose clinical reasoning as my area of focus. It isn't enough to simply try new interventions and discover their outcome. I want, at the very least, to understand why I am choosing specific interventions with specific patients, and what my expected outcome will be. If I cannot do that then I am not a practitioner, I am a technician.*

To facilitate reflection and learning, I incorporated several new outcomes into my data collection that were aimed at learning more about my clinical reasoning processes. I chose to focus on elements of clinical reasoning that are well studied in professional practice: the ability to articulate clinical cases, biomedical knowledge (Patel, Evans, Groen, 1989) and comfort level with clinical case (Jensen, 1992). With each patient case, I graded myself using the Lasater Clinical Reasoning Rubric (LCRR, Appendix A), attempted clinical reasoning flow charts using the reasons I made each decision with to map my train of thought, and rated my comfort level with each case on a scale of 0-5 (0=no understanding, total discomfort, 5= total understanding, entirely comfortable) with reasoning substantiating my feelings. Each outcome would help me identify context specific elements of my clinical reasoning that were influencing my patient care.

Lasater Clinical Reasoning Rubric								
	Patient	**301**	**302**	**303**	**304**	**305**	**306**	**307**
NOTICING	*Focused Observation*	4	4	2	4	4	N/A	4
	Recognizing Deviations from Expected Patterns	N/A	4	2	4	3	N/A	N/A
	Information Seeking	4	4	3	4	3	N/A	4
INTERPRETING	*Prioritizing data*	4	4	3	4	3	N/A	4
	Making Sense of Data	4	4	2	4	3	N/A	4
RESPONDING	*Calm, Confident Manner*	4	4	3	4	4	N/A	4
	Clear Communication	4	4	3	4	4	N/A	4
	Well Planned Intervention/Flexibility	4	4	3	4	3	N/A	4
	Being Skillful	4	4	3	4	3	N/A	4
REFLECTING	*Evaluation/Self Analysis*	4	4	4	4	4	N/A	4
	Commitment to Improvement	4	4	4	4	4	N/A	4
	Total Score (44 possible)	40	44	32	44	38	0	40

Table 2. Self-assessed clinical reasoning rubric scores.

I utilized the LCRR at the very end of each patient case, once they had completed treatment. I scored each of the boxes with a potential number of points to get in each sub section (i.e., Exeplary=4, Accompished =3, Developing = 2, Beginning = 1). Point totals of the scoring system were as follows: 1) In the Noticing portion there was a range of 3-12 possible points, 2) In the Interpreting portion there was a range of 2-8 possible points, 3) In the Responding portion there was a range of 4-16 possible points, and 4) In the Reflecting portion there was a range of 2-8 possible points. The lowest score would be 11 points, which represents “Beginning” in all categories. The highest score would be 44, for marks of Exemplary in all categories. Because patient 306 was still being treated at the time of the analysis, I did not complete the LCRR scoring.

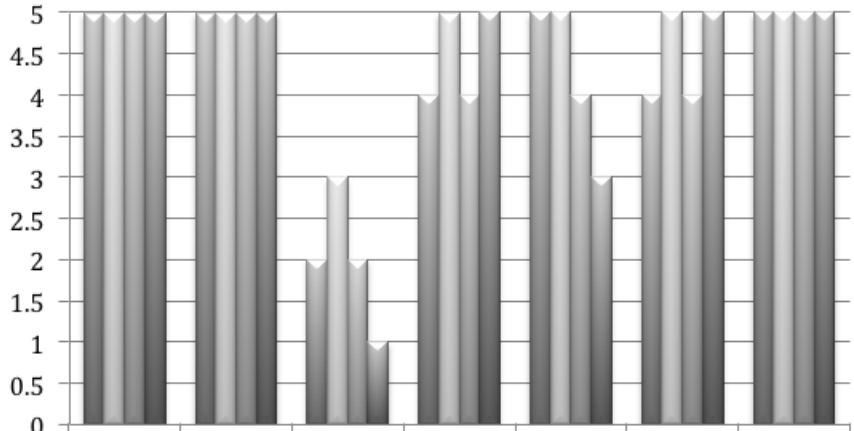
I recognize the limitation in scoring myself despite my attempts to be honest and provide evidence for my selection in each of the categories (Table 2). I did find the process beneficial because the implementation of the LCRR made me realize that it is impossible to grade yourself using this rubric. Even with the information necessary to mark each section of the rubric, it was difficult to remain true to each section without bringing in information from other sections to determine a final score.

The case of patient #303 was a tough case for me mentally. I really believed, at the time, that I was *noticing* as much as I could. I took the information the patient was giving me, asked appropriate follow up questions, and prioritized the relevant information. When I was able to reflect on what I had done in the evaluation and treatment, however, I realized I had made several mistakes, missed important data, and missed an opportunity to try an intervention that might have helped had I seen the pattern for it in the beginning. I was unable to recognize the pattern and I lost confidence in myself, which may have resulted in the patient losing confidence in my ability to help her. Grading myself and not letting the fact that I had *wanted* to do all of those things over shadow that I did not actually do them was very difficult. Interestingly, I scored myself "exemplary" with the patients I was able to treat over longer periods of time. I believe the increased scores may be due to the simple fact that I had more time to fulfill the criteria of each category. In hindsight, the LCRR would be more beneficial if an unbiased observer used it during a single patient-clinician interaction.

A clinician's comfort level with a patient case will change the type of reasoning he or she uses. I decided this would be easier to measure than the strategy itself. Trying

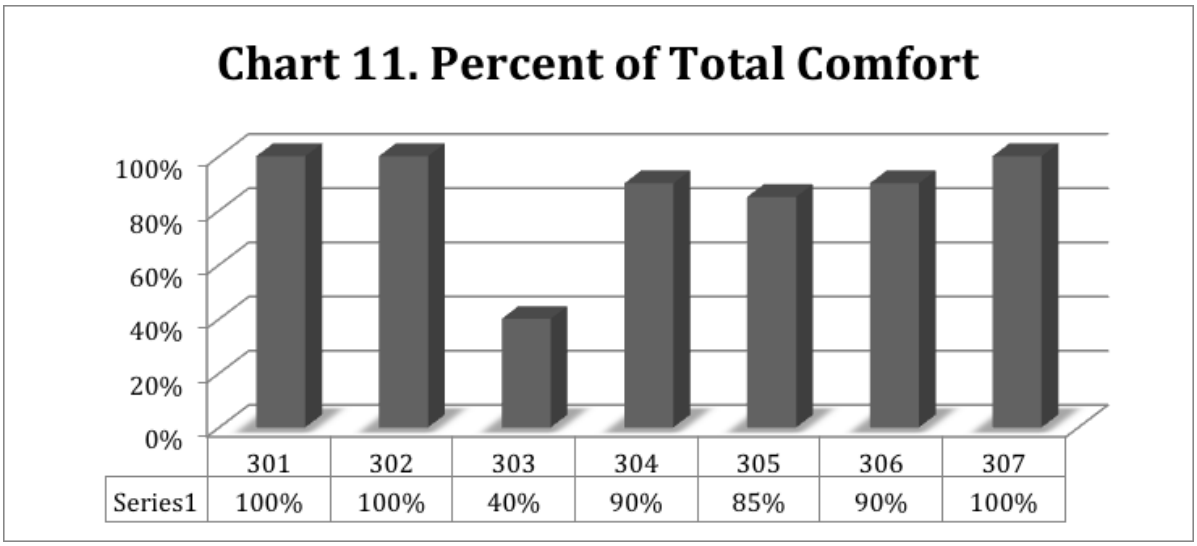
to determine whether I was using pattern recognition, a subconscious action, or a deductive reasoning strategy seemed futile. Clinicians will default to deductive reasoning strategies when confronted with patient cases that make them uncomfortable. The case content or the clinician's lack of knowledge in specific area does not allow for efficient pattern recognition (Patel et. al, 1989; Eva, 2005). I hypothesized that if I could measure my comfort level with a case, I might be able to infer the use of one reasoning strategy over another. I recorded my perceived comfort surrounding aspects of each case using a 0-5 scale (0=no understanding, total discomfort, 10= total understanding, entirely comfortable). I recorded comfort with case presentation, patient interaction, intervention possibilities, and implementation of treatment (Chart 10).

Chart 10. Perceived Comfort Level (0-5)



	301	302	303	304	305	306	307
Case Presentation	5	5	2	4	5	4	5
Patient Interaction	5	5	3	5	5	5	5
Intervention Possiblities	5	5	2	4	4	4	5
Implementation	5	5	1	5	3	5	5

Patient 303 had the lowest rankings in all categories while 301, 302, and 307 all had full marks in all categories. The Intervention Possibilities category was marked below 5 points with 57% of the patients, but I perceived total comfort in the remaining 43% of cases. I also examined my perceived comfort level as a percent of total comfort (Chart 10). Patients 303 and 305 were given the lowest comfort ratings of 40% and 85% respectively, while 3 of the 7 patients scored 100% comfort, and the remaining 2 scored 90%.



Lastly, I determined whether or not each patient case was successful (Chart 11). I used a simple yes or no answer to represent whether or not I was able to see the treatment of the patient through to the end, restoring them to full and pain free function. Patients' cases 303 and 305 did not receive successful treatment, while 301, 302, 304, and 307 received care that abolished their pain and restored their function.

	301	302	303	304	305	306	307
Intervention Success	yes	yes	no	yes	no	ongoing	yes

Table 3. Perceived success with patient case.

My perceived comfort with my intervention choices was surprising. After reflecting, I recognized there might be intervention choices, other than those I had performed, that would help my patients. I am still creating the evidence in my practice to identify a hierarchy of treatments, of what to implement when, and in what order. Recognizing that my comfort level with a case correlates to the intervention's success is also interesting. I have learned that my attitude toward an intervention or patient case will have an effect on the outcome. If I have an attitude of confidence and poise due to comfort in a case, my intervention outcomes are more positive. If I have an attitude of defeat and anxiety due to discomfort with a case, however, my intervention outcomes are poor.

To facilitate my ability to articulate clinical cases to others, I applied three steps. The first step was to share the case with my students, whether it was to treat patients in front of them or to discuss patient cases in class. The second step was to write more blog posts highlighting clinical cases on Wordpress. The third step was to map the cases with flow-charting. Flow-chart mapping is a proposed way to identify clinical reasoning skill and help build it in practice (Wheeler, Collins, 2003). I attempted the mapping on several patients, and found it to be very time-consuming and difficult. I gained insight into themes of my decision-making, such as contextual factors of the clinical environment and the patient's support groups and familial relationships.

In addition to being able to spend more time with my patients, have more time to reflect about them, and incorporate new outcomes to collect, I also had more time to research and learn. So while I was limited in the number of patients I treated during the Fall 2013 semester, much of my growth was in knowledge and application. A clinician's knowledge base has the potential to influence their clinical reasoning proficiency significantly (Patel et. al, 1989; Boshuizen and Schmidt, 1992; Woods, 2007; Boshuizen, 1997). I experienced a change in my clinical reasoning because I was able to better understand the information presented in the previous semesters, I was able to apply that knowledge more effectively, and have a greater awareness of my clinical practice.

Residency Impact

The impact the DAT residency had on my patient care, scholarship, and philosophies influenced the residency settings of both the Division I clinical setting in which I began the DAT, and the professional master's degree program in which I will complete the DAT. I believe my residency at the university directly affected my patients, and the patients of the clinicians around me. I was able to bring new ideas, new techniques, and a new attitude to the clinic. Unfortunately, the patients were more receptive to the change than my fellow clinicians. The DAT made me a more attentive, well-equipped, constructive clinician.

My residency at CBU has consisted of teaching in the professional master's program and treating patients on referral basis has influenced an entirely new set of stakeholders. I have incorporated the lessons I have learned from the DAT in to the curriculum for the students and continuing education for the preceptors. My clinical

philosophy, a product of the DAT, is infused into everything I do in the classroom. I teach primarily clinical courses that are focused on the patient care aspects of AT, my students have received lessons in clinical reasoning, psychosocial interventions, manual therapy techniques, action research and practice based evidence, the SFMA, interprofessional education and several other topics that were not part of the curriculum prior to my arrival in the program. In line with my philosophy, I have worked to share the technical knowledge I have gained by hosting several seminars and courses not previously offered. Dr. Tom Dalonzo-Baker of TMR, and Dr. Phil Plisky of SFMA conducted courses for my students and several preceptors. I believe the students have a better foundation on which to build their own path toward advance practice as a direct result of my residency and participation in the DAT.

My residency at CBU has also had an effect on the other program faculty. I believe that AT instructors should participate in patient care and outcomes collection in order to stay current, practice the skills being taught to the students, and to continue producing scholarship. As a result of my residency, the program faculty have participated in direct patient care for the first time since leaving clinical practice. The two faculty members have collected and reflected upon their patient outcomes, found weaknesses, and have pursued continuing education courses as a result. I believe they will better serve our students, and the profession, because they have again begun practicing direct patient care.

Lastly, my residency at CBU has directly affected my patients. The majority of the patients referred to me while practicing at CBU were puzzling cases for other clinicians. The patients I was provided often had chronically limiting conditions for

which they had sought treatment from several practitioners over long periods of time. Treating patients who have a more complex history of pain meant that relieving their pain was more significant to them. Though I have treated a much smaller number of patients in the residency at CBU, the impact I have had on their ailments, because of the DAT, was magnified.

Final Reflection

A clear evolution of patient care quality, successful outcomes collection, and depth of knowledge is demonstrated by the outcomes summary. Immense change is illustrated by comparing patient cases from Fall 2012 to Spring 2014. In the first fall, I was unable to integrate several paradigms with purpose; instead I was focused simply on testing interventions and observing the outcome. A poignant midterm reflection helped me to discover my areas for improvement and motivated me to implement steps to mitigate the weaknesses in my clinical processes. My ability to collect outcomes improved slightly over the course of the first semester, but organization and analysis left much room for improvement. The overall DPA Scale scores of the patient's I treated during Fall 2012 did not display a strong trend indicative of positive patient outcomes.

The specific goals I set for better organization and more consistent outcomes collection going into Spring 2013 helped establish a plan for continued clinical growth. My overall clinical effectiveness increased as illustrated by the clear trend of my collected DPA Scale score data. Patient cases further demonstrated clinical growth by displaying more complete clinical reasoning processes and definable patient and clinician-centered goals of treatment. By addressing the weaknesses of my clinical

practice and being vigilant in seeking authentic reflection, I discovered additional contextual factors that were inhibiting my clinical and professional development. I was able to make new goals informed by the evidence I had collected and reflected upon from the previous semesters, and implement a new plan.

I experienced the most accelerated growth during the Fall 2013 semester residency. The sample patient cases indicated clinical decisions founded in literature and clinical evidence, a greater awareness of pertinent patient information, and a deeper understanding and more purposeful implementation of interventions. My goals for each patient were clearly established which allowed for a purposeful and seamless integration of several clinical philosophies. I was able to collect additional information related to my clinical reasoning processes that facilitated deeper reflection with evidentiary support of my decision-making, perception of success, and other elements that influence my patient care.

The DAT had an immense effect on my clinical practice as evident by the outcomes summary and the evolution of my clinical practice ability. I have incorporated several new techniques/paradigms and demonstrated my clinical competence through improved disease and patient-oriented outcomes in my patient care. I successfully utilized global outcomes to measure the utility of interventions and my ability to apply them. I know how to analyze results for meaning, and share clinically relevant information with other clinicians, students, patients, and faculty. I have increased my knowledge of EBP and become a translational researcher by testing interventions and reporting findings. I have been honest in my reflection and am willing to feel discomfort to continue authentic clinical and professional development.

The DAT has provided me the tools I need to pioneer my unique path toward advanced practice. I am proud of my change and humbled by the growth I have yet to experience in order to continue on the path toward advanced practice. I look forward to continued growth and the vigilant pursuit of better patient care.

Chapter 4

Review of Literature

Currently, there is not an accepted singular definition of clinical reasoning (CR), pointing to its complex nature; therefore terminology must be specified in the interest of understanding. In the literature, many terms are used interchangeably to describe CR. For example, critical thinking, clinical judgment and CR may sound and be used similarly, but are very different in definition (Norman, 2005).

Critical thinking, as defined by the Annual International Conference on Critical Thinking and Education Reform, 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" (Paul, 2006). Critical thinking skills depend on a clinician's ability to ask discriminating questions and search for better ideas or decisions (Scott, Markert, Dunn, 1998). Clinical judgment, however, is the outcome of critical thinking and is the final decision about the course of a treatment or diagnosis. Clinical judgment requires critical thinking, logic, discernment, and professional self-management (Pesut, 2001).

Clinical Reasoning, in contrast, requires clinicians to use their critical thinking ability, decision-making style, knowledge and experience, as well as the concerns of the patient and any surrounding context, to inform decisions (Benner, Sutphen, Leonard & Day 2010). Clinical Reasoning is a complicated practice in cognition, metacognition, inductive and deductive cognitive skills, and the use of knowledge to gather and

analyze patient information, determine significance, and take action (Simmons, 2010; Fowler, 1997). Clinical reasoning is more than decision-making and judgment alone; it takes the integration of the clinician's unique expertise and experiences (Levine, 2013), as well as comprehension and understanding of a patient's situation (Fowler, 1997). Jones (1992) defined CR in the scope of physical therapy as a process in which the therapist, interacting with the patient and others (e.g., family members), helped patients structure meaning, goals, and health management strategies based on clinical data, patient choices, and professional knowledge and judgment (Jones, 1992; Edwards, Jones, Carr, Braunack-Mayer & Jensen, 2004). Concisely, CR is a varied and complex system of processing information and making decisions that has an effect on every clinician's diagnostic and treatment abilities (Banning, 2008).

Clinical Reasoning Frameworks

Various theoretical frameworks have been proposed in an attempt to describe CR and categorize the many factors that play a role in its application. One such framework identified the reasoning strategies occupational therapists (OTs) used to guide clinical practice. Fleming and Mattingly (1991) determined, through careful analysis of videotaped treatment sessions, that OTs working in a medical center employed at least four different types of reasoning: procedural, interactive, conditional and narrative. MacRay and Ryan (1995) further developed the framework to include pragmatic reasoning as well. While the reasoning types are distinctly different from each other, clinicians often used multiple types to address different facets of the same patient problem, with experienced clinicians being more adept at transitioning between different types of reasoning when interpreting a patient problem (Mattingly,

1991).

Procedural reasoning was used when the clinician was thinking about the disability or disease itself. Considering intervention options, determining diagnosis and prognosis, and patient prescription were components of the procedural piece. The sequence contained multiple elements, such as problem identification, problem-solving strategies, cue seeking, hypothesis generation, and goal setting, as the clinician participated in patient care (Mattingly, 1991 Newell and Simon, 1972; Elstien, 1978; Coughlin and Patel, 1987).

Interactive reasoning was applied when clinicians conversed with their patients. The goal of interactive reasoning was to get to know the patient better. The interactive reasoning process was patient-focused, instead of disease-focused, to gain information regarding the patient's feelings about a treatment or disability (Mattingly, 1989; Kleinman, 1980).

Conditional reasoning, considered a more complex type, involved complicated thinking and multiple dimensions of interpretation on the clinician's part. Conditional reasoning was an attempt to integrate information from both procedural and interactive standpoints through reflection and careful consideration of the successes and/or failures of the clinical encounter. To employ conditional reasoning, a clinician must think beyond immediate concerns and imagine possible futures, drawing upon clinical experience and expertise, to form a deeper understanding of the whole patient problem and create future goals (Flemming, 1991).

Narrative reasoning, which may be the most difficult to describe in this model, utilized all of the causal relationships and descriptions provided through procedural,

interactive, and conditional reasoning; however, it also approached the patient problem from a different perspective. To investigate a case in a narrative fashion, the clinician must be concerned with human motivation. Narrative reasoning incorporated all of the patient's motivations, feelings, and relationships, and is used to provide the clinician with a greater understanding of the motives of the people involved in a patient case. A richer understanding of the case allows for more effective clinical decisions (Mattingly, 1991).

Pragmatic reasoning was the theoretical frame that surrounded the entire framework Pragmatic reasoning is the most comprehensive as it encompasses all of the others, but it is easy to identify because it is concrete. In addition to the elements present in the other reasoning types, pragmatic reasoning also includes practical elements. The treatment environment (e.g., clinic size, equipment available, privacy, etc.), the therapist's values, knowledge, and abilities (e.g., continued education, patient care philosophy, foundational knowledge, etc.), the patient's social supports (e.g., familial relationships, team dynamics, etc.), and other contextual factors are incorporated (Kingdom & Neufeld, 2003; MacRay and Ryan, 1995).

Clinical Reasoning Styles

In addition to CR frameworks, styles of CR have also been identified. Hypothtico-deductive reasoning, for example, is the generation and testing of hypotheses to determine diagnosis. Hypothetico-deductive reasoning is also termed "backward" reasoning because hypothesis formation occurs before the gathering of information used to make a decision (Patel & Groen, 1990). Major critiques of the hypothetico-deductive reasoning style stem from the belief that hypothesis generation

and testing is merely one part of thinking, and not a complete account of the CR process. Thus, it should be considered an element of, but not the process of, CR. (Bordage, 1994; Bordage & Lemieux, 1991; Patel & Groen, 1986; Schmidt, 1990). The hypothetico-deductive style has been studied at length, and is more frequently used by novices than experienced clinicians (Elstein, 1994; Kassirere & Kopelman, 1991).

Experienced clinicians tend to use pattern recognition and "forward" reasoning in clinical practice, which are two other CR styles. Pattern recognition requires the use of vast memory networks, utilizing both scientific and case specific knowledge, to pair elements of a current patient presentation to those of past patients to form patterns the clinician uses to make a diagnosis. "Forward" reasoning, the opposite of backward reasoning, is completed by using information at hand to formulate a hypothesis or diagnosis (Beullens, 2005). When an expert clinician is faced with a patient case that is unfamiliar to them, however, a decision to use the slower, and more error prone, hypothetico-deductive style is often made (Norman, Trout, Brooks & Smith, 1994; Norman, Brooks & Allen, 1989).

History of Clinical Reasoning in Medical Literature

Early researchers concentrated on investigating the nature of reasoning with the goal of identifying a singular or best method of reasoning without much focus on clinical context (Eisenberg, 1979). Initial research focused on describing how physicians should make decisions, as opposed to examining how decisions were actually made. In the 1950s and 60s, the focus was on the Bayesian method of decision making, which analyzed the probability that the given information fit a specific diagnosis. Several assumptions resulted about clinical expertise (Elstein, 2009). The

primary assumption at that time was that biomedical knowledge was a determining factor in a clinician's level of expertise; the more knowledge a clinician possessed, the more expertise the clinician was considered to maintain. Additionally, it was assumed that CR skill was simply something experts possessed and novices lacked (Feinstein, 1967; Lusted, 1968; Bennet & Barrows, 1972). The influence of other factors in a physician's decision making, such as patient interaction and sociocultural factors, were not widely studied until the early 1970s when research into CR grew immensely.

Throughout the 1970's, Arthur Elstein and colleagues began a shift in thinking through presentation of the initial results of The Medical Inquiry Project at the Annual Meetings of the American Psychological Association (APA), the American Medical Colleges, and the Conference on Research in Medical Education. The project was a funded study to identify the intellectual tactics of expert CR and to generate a psychological theory to explain CR features. The researchers related the findings to existing theories of thinking, and developed materials to assist medical students to refine problem-solving skills (Elstein, 1972). A selection of physicians, who were nominated by colleagues as expert diagnosticians, were asked to evaluate three simulated patients (actors) while being videotaped. The physicians reviewed the video for clarification, performed 8 paper and pencil problems, and underwent a battery of tests and questionnaires. The major finding of the project was that physicians tended to generate specific hypotheses well before all available patient data had been gathered. As a result of the study, four main components of the physician's CR process were identified: attending to initially available cues and identifying problematic elements, associating problematic elements to long-term memory, generating

suggestions for further inquiry, and informally estimating a ranking of several working hypotheses (Elstein, 1972; Elstein, 1990).

The final findings of the Medical Inquiry Project were published in 1978 in the book "Medical Problem Solving" (Elstein, 1978), now considered to be the foundation of CR research (Norman, 1978; Ericsson, Prietula & Cokely, 2007). Despite its importance, several significant limitations of the project have been identified. First, peer ratings were used to identify and accept expert clinicians without the use of other criteria, though such ratings are considered unreliable (Elstein, 2009; Elstein, 1972). Research of traditional peer ratings has provided empirical evidence that suggests nomination by peers does not correlate to exceptional performance on domain specific tasks (Ericsson, 2003). Second, critical assumptions were made regarding the reasoning process of clinicians: clinical reasoning is generalizable and singular, all cases and all physicians worked under the same problem solving process. Thirdly, the study was conducted without adequate sampling, as it did not include enough physician participants and each participant was not studied across enough patient cases. Despite these limitations, the study was still extremely significant as it was that it was first attempt to relate diagnostic problem solving to general problem solving, collect "think aloud" participant data, and indicate that experts employed hypothetico-deductive reasoning strategies.

Over the next decade, the work of Elstein et al. (1972) was supported and progressed by several research studies that utilized more multivariate methodology to qualitatively learn about the CR process. Various studies were conducted, using patient vignettes and standardized patients, to observe clinicians of differing levels of

expertise reasoning through the same cases (Barrows & Bennett, 1972; Coderre, Mandin & Harasym, 2003; Doody & McAteer, 2002; Fuller, 1997), while others observed practitioners in real life clinical settings (Jones, 1992; Khatami & Macentee, 2001; Murphy, 2004; Wainwright, Shepard, Harman & Stephens, 2010; Wainwright, Shepard, Harman & Stephens, 2011).

Borrows and Bennett (1972) studied six neurology residents asked to complete a videotaped evaluation of the same standardized patient (an actress) portraying symptoms of multiple sclerosis. After the evaluation, each resident was also interviewed. Analysis of the residents' interviews and patient interactions revealed relationships between trends in the diagnostic process and problem solving methods. Multiple hypotheses were made early in the encounter with the patient. Key features of the initial presentation, decided upon by the clinician to be important or relevant, triggered further questioning for additional information (Bennett & Barrows, 1972). The neurology residents also used hypothetico-deductive reasoning strategies, confirming Elstein et al.'s previous work (Elstein et al., 1978).

Lusted (1972), like Elstein, instigated study in live clinical settings when he asked whether physicians might act under more than one set of criteria when making decisions. For instance, he suggested physicians may consider the implications of their decisions, and that their attitudes may affect diagnostic decisions (Lusted, 1968; 1972). While much of the text focused on the role of computer analysis to aide in diagnosis, a new line of research emerged. The concept that the medical decision making processes is not normative in nature, but in fact individual to the situation, patient, and practitioner, had not been addressed in previous research (Waitzkin & Stoeckle, 1972),

In 1979, Eisenberg combined observations from sociology, clinical psychology, psychiatry, and medicine to gain a more comprehensive understanding of the influences on clinical decision-making. Characteristics of the patient (e.g., social class, income and ethnic background, sex, physical appearance, treatability, emotional behavior, familial relationships), characteristics of the physician (e.g., personality, philosophy, age, education, interaction with other professionals), characteristics of the environment (e.g., settings, nature of interactions, dynamics of the medical team, peer pressure, etc.), and the doctor-patient relationship were identified as elements effecting clinical decision-making (Eisenberg, 1979). Eisenberg (1979) called attention to the considerable evidence supporting the presence of sociologic factors that affect clinical decision-making. He indicated the need for a shift in the study of CR away from normative descriptions of how a physician should behave and toward a better understanding of how and why clinicians behave in a certain manner (Eisenberg, 1979).

The research trend of the 1970's was centered on problem solving. The model was very general and researchers made the assumption that expert clinicians did not generate more hypotheses or diagnoses faster than novices, but only generated the more accurate hypothesis. The distinction was considered related to experts having a greater content knowledge, instead of utilizing a unique process. The next decade of research emphasized expert knowledge, instead of expert processes due to these assumptions.

During the 1980s, researchers provided insight into the knowledge and memory of experts in several domains. For example, expertise in chess was highly

studied. The most reliable measure of expertise in chess was the ability of the player to recall a specific game position. Experts were able to recall the position of approximately 80% of the game pieces after a 5 second exposure to the playing board (Simon, 1983). Chess masters were capable of memorizing an estimated 50,000 game positions and were able to recall each position to use in a given game situation. As a result, memory performance was recognized as a condition of expertise (Muzzin, Norman, Feightner & Tugwell, 1983). Similarly, specific knowledge appeared to be more related to expertise than general skill.

While appearing to be a good measure of expertise in several fields, memory performance was not found to be transferable to medicine (Patel & Groen, 1986; Schmidt & Boshuizen, 1988). Patel and Groen (1986) analyzed physician interpretation and treatment of specific patient pathophysiology. A prepositional analysis was performed on patient case descriptions created by the participants, in an attempt to bridge the gap between data and the running diagnostic process. Prepositional analysis allowed researchers to classify the antecedents and consequents of the participants' decision framework. The classification was used to create a "map" of the causal network (i.e., the ability to recall and use a vast collection of "if-then" rules) and explain diagnostic choices. By identifying the way in which available information was being linked to diagnostic decision-making, Patel and Groen (1986) reached the conclusion that it was not feasible to create an explicit mapping of expert recall. In short, it was impossible to capture all of the knowledge, situational, medical, or otherwise, needed to practice in medicine (Hughes, Benner, Hughes & Sutphen, 2008). Even though

memory recall may be indicative of expertise in other disciplines, such as chess, memory recall was found to be a poor indicator of expertise in medical reasoning.

Since memory recall ability failed correlate to expertise in medicine, researchers again shifted focus to mental representations of knowledge. In the 1990s, a primary focus of the research studies was to identify types of knowledge organization. Through these studies, three types were identified: basic science and causal rules, representations of signs and symptoms and diagnoses, and examples based on direct experience with patient cases (Schmidt, Norman & Boshuizen, 1990; Norman, 2005). In the end, investigators agreed that the implications of CR research findings were that no singular process, or element, emerged as correlated to expertise (Guest, Regehr & Tiberius, 2001; Eva, 2003; Kalatunga-Moruzi, Brooks & Norman, 2004). Instead, expert CR was a consequence of an extensive knowledge base, effective mental organization, and the use of several integrated decision-making strategies. Despite more than 30 years of research studies, the analysis of CR has resulted in little progress towards identifying a singular best CR method, style, or framework (Norman, 2005).

The Novice-Expert Continuum

Though no clear model has been unanimously accepted, investigators have postulated CR to be a dual process including analytic and non-analytic systems (Jones, Edwards, Carr, Braunack-Mayer & Jensen, 2004; Jones, Edwards & Gifford, 2002; Audetat, Dory, Nendaz et al., 2012; Audetat, Laurin, Sanche et al., 2013; Charlin, Lubarsky, Millette et al., 2012; Eva, 2005). Medical educators have traditionally focused on analytic models, which rely on the interaction between signs and symptoms and diagnosis as being paramount in establishing clinical expertise. The analytic model,

also termed hypothetico-deductive reasoning, is the most commonly taught and used form of reasoning for medical students (Jones, Edwards & Gifford, 2002; Audetat, Laurin, Sanche et al., 2013). As the name implies, a clinician utilizing this model identifies cues from and about the patient to generate an initial hypotheses, then continues to collect data and modify the hypotheses until a single diagnosis is reached (Edwards, Jones, Carr, Braunack-Mayer & Jensen, 2004; Boshuizen & Schmidt, 2007; Mamede & Schmidt, 2007). The analytical model is similar to Beyes' theorem of regression analysis, in which he suggests clinicians analyze key signs and symptoms to determine their singular and collective probability to ascertain the likelihood that a specific diagnosis is correct (Edwards, Jones, Carr, Braunack-Mayer & Jensen, 2004).

The theory, however, has been deemed unrealistic because such information is likely unavailable to clinicians at the time of evaluation and the complexity of calculations needed to reach that conclusion are too difficult (Phua & Tan, 2007; Eva, 2007). Most investigators accept that students begin utilizing the analytic model primarily, though researchers have suggested it is error-prone, inefficient, and weak (Audetat, Laurin, Sanche et al., 2013; Groen & Patel, 1985; Patel, Groen & Norman, 1991). As young clinicians build cognitive archives of patient histories, signs, symptoms, and characteristics of diagnoses, termed 'illness scripts,' they develop the capability to recognize patterns and use non-analytic skills (Eva, 2007).

The non-analytic strategies, primarily scheme-inductive and pattern-recognition, utilize the intuitive tacit system for generating initial hypotheses. In pattern-recognition problem solving, particularly when time constraints are present, there is immediate identification and analysis of patterns within a case (Audetat, Dory,

Nundez et al., 2012). Pattern-recognition is unconscious (Phua & Tan, 2013) and is a result of the vast database of knowledge and experience a clinician possesses. The process is completed by combining knowledge and experience with a capacity to recognize patterns within that database (i.e., pairing key elements of a new case with the patterns seen in previous ones) (Edwards, Jones, Carr, Braunack-Mayer & Jensen, 2004; Pottier, Hardouin, Hodges et al., 2012).

Scheme-inductive reasoning is guided by a vast organizational structure of knowledge that differentiates between categories of conditions. A visual representation would be similar to an inductive tree with many branches representing potential paths for decision-making. The presence or absence of certain clinical findings leads the clinician to take a specific path following the branches to reach a conclusive diagnosis. The scheme-inductive reasoning method is thought to yield better outcomes, though there is not a consensus on whether analytic or non-analytic reasoning produce more error (Audetat, Laurin, Sanche et al., 2013; Charlin, Lubarsky, Millette et al., 2012).

Both forms of reasoning are not mutually exclusive and are carried out in tandem by novice and expert clinicians, though in varying degrees based on contextual factors. Novices have not had the experience necessary to develop a framework of past memories with which to associate learned information and are less likely to use the non-analytic forms of reasoning. Instead, novices must rely on the signs and symptoms to diagnose. In contrast, an expert is able to rely on the principles and relationships that exist amongst patient cases, identify patterns, and diagnose within their vast memory framework. Excessive reliance on non-analytic forms of reasoning alone may

cause diagnostic error due to its intuitive nature and reliance on first impression (Edwards, Jones, Carr, Braunack-Mayer & Jensen, 2004; Eva, 2004). A combination of analytic and non-analytic reasoning yields the best diagnostic accuracy in both novice and expert clinicians (Eva, 2007), though novices are not likely utilize non-analytic reasoning unless prompted to do so (Speicher, Bell, Kehrhahn & Casa, 2012).

Benner (1992) was able to provide a more clear understanding of the influence that experience may have on expertise. Intensive care nurses (i.e., adult, pediatric, and neonatal) of varying expertise were categorized into three groups by assessing the qualities of their patient care decisions: advanced beginner, intermediate, and expert. The advanced beginner nurses made decisions guided by protocols and procedural knowledge, and felt their practice was unsafe when confronted with a complex or confusing patient problem. Intermediate nurses were further subcategorized into competent or proficient groups. A nurse became competent when he or she was able to gain clinical experience and learn from colleagues. The competent nurses continuously questioned each clinical situation in an attempt to learn as much as possible from each situation. When a competent nurse began interpreting information and analyzing situations instead of simply following orders or procedures, he or she transitioned into the proficient category. Expert nurses had a more fully developed grasp of clinical situations, higher confidence in knowledge of the situation, and the ability to quickly determine the precise clinical problem of each patient case. Once the nurses were categorized by decision-making qualities, experience level, in years, was determined.

Benner (1992) provided data that expressed and supported the existence of a novice-expert continuum (Hughes, Benner, Hughes & Sutphen, 2008). The nurses of

the advanced beginner category had up to 6 months of work experience. The competent and proficient nurses (intermediate group), as well as the expert group, had at least two years of intensive care unit experience, which indicated years of experience alone was not a predictor of expertise. Researchers have expanded on Benner's findings, concluding that experience is necessary to create competence, but is not sufficient for expertise; in short, all experienced clinicians are not experts (Ericsson, Whyte, Ward, 2007; Chrstensen, Hewitt-Taylor, 2006).

Assessment of Clinical Reasoning

Several attempts have been made across health care professions to identify domain-specific measures for CR (Lasater, 2007). The most comprehensive literature on the measurement of CR is found in nursing and medical education. Unfortunately, the absence of a gold standard for assessing CR makes it difficult to analyze any instrument, since there is no standard with which to compare and determine statistical utility.

To measure construct validity and evaluate statistical utility, some researchers have employed different correlative methods. Beullens, Struyf and Van Damme (2005) have correlated students' reasoning acuity, as measured by a series of extended matching questions (EMQs), to their own think-aloud problem solving. Extended matching questions are a style of multiple-choice question, which include a theme, an option list, a lead in statement, and at least 2 item stems. While EMQs are meant to assess factual knowledge, Beullens et al. (2005) set out to test CR with EMQs as opposed to factual knowledge in isolation. By also testing the students' think-aloud

problem solving, the researchers were able to gain insight into the cognitive processes (Van Someren, Barnard & Sandberg, 1994) of the students' decisions.

Murphy (2004) utilized focused reflection and articulation exercises to promote CR in first year nursing students (Beullens, Struyf & Van Damme, 2005; Murphy, 2004). Reflection is the act of looking back on an experience and evaluating it for meaning by comparing it with other experiences. Reflective writing increases learning and can be used to identify CR skill (McCaugherty, 1991; Mountford & Rogers, 1996; Lee & Hutchison, 1998). In those displaying expert clinical reasoning, reflections will be more fully descriptive, about the patient, the situation, and their feelings about learning; those with novice clinical reasoning will have reflections that read more like a sequential series of steps (Murphy, 2004; Wainwright, Shepard, Harman & Stephens, 2010; Epstein & Hundert, 2002). Students who struggle to ascertain the clinical implications or effects reflection may have on their professional development may initially need some provocation or guidance to write thoughtfully and analytically on their own (Kuiper, Pesut & Kautz, 2009; Speicher et. al, 2012).

Tanner (2006) completed an extensive review of the CR literature to create Tanner's Clinical Judgment Model (Tanner, 2006). The model was comprised of four overarching aspects of expert clinical judgment in nursing: 1) Noticing (perceptual grasp of the situation at hand), 2) Interpreting (sufficient understanding of the situation to respond), 3) Responding (deciding on a course of action appropriate for the situation), and 4) Reflecting (reflection-in-action, attending to patients' responses to the nursing action while in the process of acting; reflection-on-action, reviewing outcomes of the action). The model became the conceptual framework for Nielsen,

Stragnell and Jester's (2007) Guide for Reflection. The Guide for Reflection directs students through examination and exploration of their own clinical situations, but did not provide a rating system from which to grade the products (Lasater, 2007).

The Lasater Clinical Judgment Rubric (LCJR) (Appendix 11) was created based on Tanner's model and the Guide for Reflection. Unlike the pervious instruments, the LCJR is used to assess student thinking through a specific criteria for evaluating CR (Lasater, 2007; Lasater & Nielsen, 2009). The LCJR contains 11 dimensions described under the four developmental levels outlined by Tanner (2006). Noticing incorporates focused observation, recognition of deviations from expected patterns, and information seeking. Interpreting includes prioritizing data and making sense of data. Responding effectively is through calm, confident manner, clear communication, well-planned and flexible intervention, and clear mastery of necessary skill. Finally, reflecting includes evaluation and self-analysis and a commitment to improvement. Each dimension is ranked by comparing the student's performance with the beginning, developing, accomplished, and exemplary characteristics that were defined within each of the dimensions (Laseter, 2007)

The rubric created by Laseter (2007) clearly delineated areas for a student to be graded, with specific expectations for both the student and the educator. While it was created to assess any singular clinical experience, it is also had enough sensitivity to detect differences in students' perceived abilities from the beginning to the end of a semester's coursework (Lasater & Nielsen, 2009). To date, it is the only nursing specific CR rubric with relevance for all clinical contexts.

In undergraduate medical school education, the Andersen CR Rubric was developed as a tool for measuring undergraduate medical students' CR through the careful grading by a medical educator of patient vignettes (Hughes, Benner, Hughes, and Sutphen, 2008). A patient vignette is a short description of a patient case complete with history, observation, and evaluation. Through development, validation and pilot testing, a rubric was established that included ten content areas: 1) Identifying relevant clinical information by incorporating it into a hypothesis, 2) Utilizing relevant information to weigh the hypotheses, 3) Detail the appropriate hypotheses, 4) take timeline considerations into account, 5) Hypothesize correct mechanisms for signs and symptoms, 6) Discuss ideas using logical steps in reasoning of hypotheses and mechanisms,7) Support individual steps in reasoning with relevant clinical information from the case, 8) Identify useful learning points, 9) Demonstrate medical knowledge of the issues in the case appropriate of the student's level, 10) The overall approach to the clinical case.

The value set for each content area was 10 points, with the total rubric being 100-points. The rubric contained a description that explained each of the ten content areas, the criteria for each area, and the performance expected by the student to be awarded marks, which increased the reliability of the scale. Inter-rater ($r=0.84$, $p<0.05$) and intra-rater ($r=0.81$, $p<0.01$) reliability were tested and found to be high when tested by independent graders, as well as the same graders, one year later (Andersen, Peterson, Tonkin & Cleary, 2008).

Rubrics and grading scales of this nature are relatively new in medical education and indicate attempts by educators to better understand the illusive "art" of

medical practice and apply it to the growing instruction of evidence-based medicine. Unlike nursing and medicine, AT has not yet identified the elements of CR and judgment that are specific to AT practice domains. Several educators have expressed the need for introducing a CR model so a more definitive approach to critical thinking during AT educational experiences may be produced (Fuller, 1997; Geisler & Lazenby, 2009; Knight, 2008a; 2008b). Athletic Training educators still struggle to understand how to facilitate the acquisition of CR skills in students, primarily because a structure in which to do so has not been identified (Heinerichs, Vela, Drouin, 2013).

The NATA currently hosts a webinar entitled, "The NATA's Strategies for Assessing and Teaching CR in Athletic Training Education," directed at providing educators with ways to incorporate reasoning and decision making skills into curriculum for undergraduate students (Vela, 2013). Independent researchers have also begun to study CR in AT education. Heinerichs, Vela, and Druin (2013) recently investigated the effect of formal learner-centered clinical reasoning instruction on undergraduate AT students' clinical reasoning, reflection, and case presentation attributes (i.e., length, conciseness, case summary, and expression of clinical reasoning). Heinrichs et al. (2013) concluded that formal clinical reasoning development allowed students to be more aware of their cognitive processes, create more concise and meaningful case presentations, and express clinical reasoning skills that facilitated learning and feedback .The publishing of this article served as evidence that educators have recognized the need for research in this area in AT.

Future Research

Clinical reasoning is a complex process and is difficult to assess, as is evident in the current body of literature. Continued research into the CR processes of health care practitioners is needed. As the health care environment changes and AT education evolves, studying CR will help AT join in inter-professional collaboration, produce evidence of better clinical practices, and produce more effective educational strategies with which to develop future practitioners.

From a foundational perspective, research in AT must be conducted to explore the fundamentals of didactic and CR unique to AT. Because of the context-specific nature of CR in any domain, it is imperative that future research identify elements unique to AT. Learning from previous research and recreating tested methodologies from other disciplines may help to better understand the CR approaches of both student and professional athletic trainers. With this, these research efforts would help to define CR terminology within the scope of AT.

Ultimately, theories for the CR process of athletic trainers must be created. Research should also examine the elements of CR, which includes critical thinking, decision-making, reflection, and knowledge organization. The aim of future research should also be to identify techniques that support the evolution of clinicians' abilities to evolve from novice to expert more effectively. To do so, AT needs to also create research in the area of CR skill assessment of both students and professionals. We need to begin creating a comprehensive perspective of CR. Eventually, we will be able to provide further insight into how the CR of athletic trainers relates to that of other health care professionals.

Chapter 5

Applied Clinical Research Project

Clinical reasoning (CR) is a dynamic and complex mental process of decision-making used in the evaluation and management of a patient.[1] More than the act of performing skills or memorizing information, CR is the ability to synthesize facts, assess informational value, and apply concepts while adjusting decisions and action as new information is gathered.[2] In recent years, health care educators have called for CR to be taught as part of curriculum, for the gap to be closed between didactic knowledge and clinical application, and for the mental laziness, created by high tech medicine, to be replaced with critical thinking.[1,3-5]

Previous research has primarily been focused on the different types of reasoning and the ways in which experts are distinct from novices. Novice clinicians predominately utilize hypothetico-deductive reasoning, a means of forming and testing hypotheses based on data derived from patient history and examination.[6] As professional experience is gained, novices begin to develop frameworks of clinical knowledge and are able to start recognizing common case patterns earlier in patient histories or evaluations.[2] Experts, in contrast, utilize non-analytical forms of CR, such as case-pattern recognition, as their frameworks of clinical knowledge are deeper and well-established. When presented with a novel case, however, experts will also utilize hypothetico-deductive reasoning to test plausible diagnoses.[2,6-8] In general, it is the ability to utilize several reasoning systems, to best serve the clinician from patient to patient, that differentiates expert from novice clinicians.[6]

In athletic training (AT) education, there has been differing opinion regarding the transition from the internship model. Concerns have been expressed regarding AT students lacking CR skills and suffering from the inability to apply didactic knowledge to actual patient care.[7-10] Concerns regarding student development in these areas extend past professional education, however. Knight[9] has encouraged professionals to further critical thinking skills and set an example for students by acting as real models of how sound CR is applied in day-to-day patient care.

An assumption has been made that ATs will continue developing reasoning processes as part of a natural progression on the continuum from novice to expert clinician as professional experience is gained. Expertise, however, is not achieved by years of experience alone. Expertise in AT is dependent upon many elements (e.g., meaningful clinical and personal experiences, immediate feedback, outcomes, and mentoring)[11-12] and is also a highly self-regulated process.[12]

Currently, a formal way for athletic trainers to measure the development of clinical knowledge frameworks and assess evolution of reasoning systems at the professional and post-professional education levels does not exist. As the understanding of CR in healthcare evolves, the AT profession needs to determine how best to evaluate, teach, and mentor CR skills, or risk falling behind other health professions at the professional and post-professional level.[4,6-8,13-19]

The purpose of this study was to gain insight into the CR of athletic trainers participating in a post-professional, advanced practice doctoral program. The way in which the athletic trainers viewed changes in their CR ability through the first semester of the clinical residency component of the program was determined. A

secondary purpose was to determine how the athletic trainers viewed their self-efficacy, the belief that one is capable of accomplishing a behavior or developing a competency,[20] compared to novice and expert clinicians in several content areas of AT. The research project was guided by the following questions: 1) Does the self-efficacy of Doctor of Athletic Training (DAT) students change; 2) Do DAT student perceptions of CR change; and, 3) Do DAT student perceptions of their CR abilities change?

Methods

Design

A within subjects design was employed with pre- and post- intervention surveys of students' self-efficacy and perceptions of clinical reasoning process and ability. The University of Idaho Institutional Review board certified this project as Exempt.

Participants

Seventeen students (4 males, 13 females; average age = 34.88 ± 10.28 years of age) volunteered to complete a survey from a pool of 20 students (85% participation rate) enrolled in their first year of the University of Idaho DAT program. Participants had varying years of experience, ranging from 2-5 years (n=4, 23.53%), to more than15 years (n=3, 17.65%). At the time of the survey, all participants were providing direct patient care and only 2 participants spent more than 50% of their time teaching in a classroom setting (Figure 1). Written consent was obtained from each participant. The survey was administered via an online survey creation and administration tool.

Demographic Responses		
	%	n (17)
Gender		
Male	23.53%	4
Female	76.47%	13
Age		
21-30	47.06%	8
31-40	29.41%	5
41-50	5.88%	1
51-60	17.65%	3
Highest Degree Completed		
Baccalaureate	11.76%	2
Professional Masters	5.88%	1
Post-Professional Masters	82.35%	14
Years Practicing as an AT		
2-5	23.53%	4
6-10	47.06%	8
11-15	11.76%	2
16+	17.65%	3
% Time spent Teaching in a Classroom Setting		
0-25%	70.59%	12
26-50%	17.64%	3
51-75%	11.76%	2
76-100%	0.00%	0

Figure 1. Participant demographic information in detail.

Instrument

A survey (Appendix 11) was developed to assess student perception of CR, perceived level of confidence with the clinical reasoning process, and self-efficacy in key standards of AT clinical practice as compared to practitioners at different levels (i.e., entry level, fellow colleagues of similar experience, and expert ATs). Each research element was assessed via separate portions of the survey.

Self-efficacy (SE) was defined as the belief that one is capable of accomplishing a behavior or developing a competency.[20] A self-report scale was created for use over 4

scaled-response questions ("very low" = 1, "very high = 4). Scales of this type have been found to be strong predictors of performance.[20] Self-efficacy of 12 line items was self-reported. The line-items included: 1-5) The 5 practice domains of AT as defined by the Board of Certification (BOC),[21] 6) Research implications in clinical practice, 7) Professional responsibility, 8) Patient outcomes, 9) Statistics, 10) Basic science, 11) Scholarship, and 12) Mentorship. Participants were asked to rate their self-efficacy across the 12 line-items multiple times: 1) SE compared to a recently certified athletic trainer, 2) SE compared to a colleague with the same amount of experience (in years), 3) SE compared to an expert. The data collected from this instrument was meant to help identify where along the continuum of novice to expert each participant perceived himself or herself to be.

Clinical reasoning perceptions (CRP) were assessed using a 10-item structured questionnaire developed by the Faculty of Medicine, University of Geneva, Switzerland.[19] The CRP was created to assess medical students' self-reported ease or difficulty with the steps of the hypothetico-deductive reasoning approach after an introduction to CR unit. Each item (Figure 2) is rated on a 4-point scale (1= "fully disagree", 4= "fully agree"). The internal consistency of the CRP (Cronbach's alpha coefficient) was high as calculated by the original researchers across 3 administrations of the survey at 0 ($\alpha = 0.91$), 6 ($\alpha = 0.95$), and 12 ($\alpha = 0.94$) months apart.[19]

Perception of the participant's clinical reasoning abilities was assessed using a modified version of the Lasater Clinical Judgment in Clinical Practice Survey (LCJPS). The LCJPS was developed by Lasater[18] to accurately assess nursing students' self-report of their confidence in applying clinical judgment to patient care. Several

researchers have examined the face and content validity, construct validity, and several criterion-related validity of the LCJPS.[18,22-23] The LCJPS was determined to be sensitive enough to measure change in student perception over one semester.[18,22] Cronbach alpha reliability coefficients for the LCJPS were measured by the original researchers (α=0.62),[18] in unpublished repeated studies (α=0.72-0.82),[24] and in published works (α=0.79).[22] While the initial reliability measures were low, subsequent data collections revealed higher reliability. The LCJPS was modified (LCJPS-mod) by the researchers of this study, with a simple substitution of terminology, to be directed at athletic trainers instead of nurses. The LCJPS in its original form was not created to assess content or context specific information[18] so the LCPJS-mod was well suited for the purpose of the study.

The survey, which included SE, CRP, and the LCPJS-mod, was examined for content validity, a measure of how appropriate the items seem to a set of knowledgeable reviewers. A panel of 5 athletic trainers, of varying years and types of professional experience, were given the survey to review, confirm form, wording, order, and understanding. After validity was established, the survey was administered to a sample of 4 students enrolled in their second year of the DAT. Reliability was determined by a retest of the same sample 7 days apart. A correlation coefficient was computed $r=0.77$ ($n=4$, $df=2$, $p=0.05$) to ensure that the test exceeded the recommended reliability coefficient of $r>0.70$.[25] Correlation coefficients were also computed separately for the LCJPS-mod ($r=0.71$), CRP ($r=0.99$), and SE ($r=0.68$) ($n=4$, $df=2$, $p=0.05$).

Procedures

An informational session was held prior to the start of the fall semester to inform the students that responses would remain confidential and would not have any effect on their academic standing within the DAT program. Potential participants were also informed that their participation in the study was voluntary and participants could withdraw at any time without penalty. The participants were then sent the online survey via email. The survey was administered prior to, and after the completion of, the first fall semester DAT coursework, approximately 4.5 months apart.

Data Analysis

A paired t-test was used to determine differences in SE, CRP, and LCJPS-mod scores from pre- to post- test. The effect of demographic variables on change in each portion of the survey was determined by ANOVA and ANCOVA. A value of $p=0.05$ was set *a priori* to indicate statistical significance. Data analyses were conducted using SPSS v. 16.0.1 (*SPSS Inc., Chicago, IL*).

Results

The results from each section of the survey were analyzed separately. The first section reports students SE across several items, compared to varying levels of AT ability. The second section reports students perceived confidence in the clinical reasoning process, determined by the results of the 10-item CRP. Finally, the perceptions of participant's clinical reasoning abilities are reported via their scores on the LCJPS-mod portion of the survey.

Self-Efficacy

Statistically significant change was found in the SE scores of the participants from the beginning to end of the semester in each of the 4 classifications (SE alone, $p<0.004$; SE compared to entry-level, $p<0.001$; SE compared to peer, $p<0.010$; SE compared to expert, $p<0.000$). Several of the domains and content areas were also found to have significant change after the semester (Figure 2). The highest and most significant change was calculated in treatment and rehabilitation ($p< 0.001$), research implications in clinical practice ($p< 0.001$), patient outcomes ($p< 0.002$), and mentorship ($p< 0.017$).

Perceived Confidence in Clinical Reasoning

The number of participants who responded, "fully disagree," "disagree," "agree," and "fully agree" to each of the CRP questions were summed (Figure 3). Prior to the semester, 100% (*n=17*) of the participants felt at ease with 'summarizing the main features of a patient's problem' and 94.12% (*n=16*) did not have any problem 're-evaluating hypotheses in light of new findings.' A slightly lower percentage (88.24%, *n=15*) felt at ease with 'applying newly acquired information' and 'familiarity with the problem-solving approach.' Some participants reported difficulty with 'organizing hypotheses hierarchically' (47.06%, *n=8*) and 'defining the context of a patient's problem' (29.41%, *n=5*).

Self Efficacy of...	t(17)	p	95% CI	Pre- Mean	Post- Mean	Change
Prevention and Wellness	2.063	0.056	[-0.596, 0.008]	2.882	3.176	0.294
Clinical Evaluation and Diagnosis	2.073	0.055	[-0.714, 0.008]	2.882	3.338	0.456
Immediate Care	1.571	0.136	[-0.691, 0.103]	3.309	3.691	0.382
Treatment and Rehabilitation	4.243	0.001	[0.794, -0.265]	2.824	3.335	0.511
Organization and Administration	1.074	0.299	[-0.229, 0.700]	3.250	3.368	0.118
Professional Responsibility	0.643	0.529	[-0.758, 0.405]	3.412	3.603	0.191
Research Implications in Clinical Practice	4.243	0.001	[-1.323, -0.441]	2.176	2.868	0.691
Patient Outcomes	3.781	0.002	[-1.744, -0.491]	2.132	3.250	1.118
Statistics	0.808	0.431	[-0.853, 0.382]	1.971	2.235	0.265
Basic Science	2.384	0.030	[-0.778, -0.046]	2.441	2.794	0.353
Scholarship	2.167	0.046	[-1.047, -0.011]	2.250	3.029	0.779
Mentorship	2.678	0.017	[-1.159, -0.135]	2.882	3.515	0.632
Self Efficacy by Classification	**t(17)**	**p**	**95% CI**	**Pre- Mean**	**Post- Mean**	**Change**
Self-Efficacy	3.348	0.004	[-8.550, -1.920]	31.647	36.882	5.235
Self-Efficacy compared to entry-level clinician	4.237	0.001	[-8.624, -2.904]	38.235	44.000	5.765
Self-Efficacy compared to peer	2.945	0.010	[-9.372, -1.502]	37.125	42.563	5.438
Self-Efficacy compared to expert clinician	6.899	0.000	[-9.150, -4.849]	22.824	29.824	7.000

Figure 2 Two Tailed Paired t-test of self-efficacy in domains and content areas, and of self-efficacy classifications. Statistics highlighted in light grey were statistically significant, dark grey were not statistically significant.

	Agreement (n %)		Disagreement (n %)		Mean		Standard Deviation		t(17)	Significance	95% CI
Question	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-			
I feel generally familiar with the problem solving approach	15 88.24%	16 94.12%	2 11.76%	1 5.88%	3.06	3.12	0.430	0.490	0.566	0.580	[-0.28, 0.16]
I feel at ease with the different steps of the process	13 76.47%	14 82.35%	4 23.53%	3 17.65%	2.94	2.88	0.610	0.490	0.808	0.431	[-0.19, 0.43]
I have no problems defining the context of a patient's problem	12 70.59%	14 82.35%	5 29.41%	3 17.65%	2.82	2.88	0.640	0.490	0.324	0.750	[-0.44, 0.33]
I feel capable of summarizing the main features of a patient's problem	17 100.00%	17 100.00%	0 0.00%	0 0.00%	3.29	3.29	0.470	0.470	0.000	1.000	[-0.33, 0.33]
I feel competent generating working hypotheses	14 82.35%	16 94.12%	3 17.65%	1 5.88%	2.94	3.06	0.560	0.430	1.000	0.332	[-0.37, 0.13]
I have no problem in re-evaluating my hypotheses in the light of new findings	16 94.12%	14 82.35%	1 5.88%	3 17.65%	3.29	3.18	0.690	0.730	0.808	0.431	[-0.19, 0.43]
I feel capable of organizing my hypotheses hierarchically	9 52.94%	14 82.35%	8 47.06%	3 17.65%	2.59	2.88	0.620	0.490	1.464	0.096	[-0.65. 0.06]
I have no difficulties in applying newly acquired information to a problem	15 88.24%	14 82.35%	2 11.76%	3 17.65%	3	3.13	0.610	0.720	0.696	0.496	[-0.48, 0.24]
I feel at ease managing patient problems	13 76.47%	15 88.24%	4 23.53%	2 11.76%	2.88	2.94	0.600	0.430	0.368	0.718	[-0.40, 0.28]
I feel competent applying the clinical reasoning process in patient care	13 76.47%	12 70.59%	4 23.53%	5 29.41%	2.88	2.71	0.600	0.690	0.899	0.382	[-0.24, 0.59]

Figure 3 Clinical Reasoning Perceptions (CRP) summarized results. Agreement is represented by responses of "fully agree" and "agree". Disagreement is represented by responses of "fully disagree" and "disagree".

After the semester, positive change was reported in 7 of the 10 items. The most change occurred in the percentage of participants who reported ease with the 'capability to organize hypotheses hierarchically', which increased to 82.35% (*n=14*), a change of 29.41% (*n=5*). Ease with 'Defining the context of the patient's problem', 'generating a working hypothesis', and 'managing patient problems' were also reported by 11.76% (n=2) more participants after the semester.

Participants reported decreased ease with 3 items. The number of participants who felt at ease with 're-evaluating hypotheses in light of new findings' decreased from 94.12% (*n=16*) to 82.35% (*n=14*). 'Applying new information to a problem' and 'applying the clinical reasoning process in patient care' each decreased by 1 participant.

Perceptions of Clinical Reasoning Ability

All items in the LCJPS-mod were summed, according to the scoring procedure of the original survey researchers,[18] for total pre- and post- scores of 92.25 and 96.37 respectively. Scores ranged from 71-106 points prior to the semester, and 84-107 points after the semester. One participant did not complete the post- LCJPS-mod so his/her results were not included. Descriptive information of the pre- and post- scores is provided in Figure 4. The majority of participants (68.75%, *n=9*) experienced an increase in LCJPS-mod scores from beginning to end of semester. Correlation of beginning and end of semester LCJPS-mod scores was high, meaning that participants with high scores at the beginning of the semester also tended to have high scores at the end of the semester. Some participants experienced a decrease in score (25%, *n=4*) from beginning to end of semester, and one participant's scores stayed the same.

	Mean	n	Standard Deviation	Standard Error of the Mean
Pre-	92.250	16	8.497	2.124
Post-	96.375	16	6.702	1.676

	Mean	Standard Deviation	t(16)	P
LCJPS-mod	4.125	7.402	2.229	0.042

Figure 4. Descriptive statistical summary with results of two-tailed paired t-test of LCJPS-mod scores.

Discussion

Self-Efficacy

Significant change was found in the participants' SE in the majority of the content areas assessed. The content areas that did not change significantly were immediate care, organization and administration, professional responsibility, and statistics. The pre-testing scores of SE in immediate care, organization and administration, and professional responsibility were the highest compared to the other domains; this may indicate the participants' already high level of SE in these areas upon entrance in the program. Practitioners with several years of clinical experience should be well versed in immediate care and organization and administration procedures as they are essential, mandatory expectations for all athletic trainers set forth by BOC Practice Standards (Standards 3,7).[26] The DAT is a voluntary post-professional degree for athletic trainers looking to advance their clinical practice. Athletic trainers who are willing to commit the considerable time and effort to the DAT program most have a strong sense of inherent professional responsibility, substantiated by the high SE scores in professional responsibility. The last content area that did not significantly change was statistics, which may have resulted from the participants having not reached the statistics components of the program curriculum

at the time of the survey or because the content area may not have been a primary focus of the participants' post-professional training or clinical practice.

Outcomes of performance, not performance itself, have an effect on SE.[20] Positive outcomes increase SE, while negative outcomes decrease SE. Elements of the DAT curriculum include the instruction of new assessment methods and manual therapy techniques, research into several clinical paradigms, and collection and analysis of clinical outcomes. Students in the DAT evaluate their patient care on a daily basis and experience positive and negative clinical outcomes. Self-efficacy is affected by outcome of performance, so participants who experienced more positive outcomes in their patient care may have had more positive change in SE. The SE areas that may be most affected by the collection and analysis of clinical outcomes are prevention and wellness, clinical evaluation and diagnosis, treatment and rehabilitation, and patient outcomes. The verbal communication of confidence and faith in one's abilities also increases SE.[20] Patients may express more confidence in their clinician's abilities if they are experiencing positive change as a result of the clinician's performance. A clinician may have higher SE if they are having a greater positive effect on their patients.

In turn, high SE increases motivation, academic performance, and overall interest in subject matter.[20] The participants who experienced the most change in their SE over the semester may have experienced an increase in their clinical performance, motivation, confidence, and positive patient outcomes. If high self-efficacy beliefs equate to improved performance, developing post-professional programs that enhance learner self-efficacy may ultimately lead to improved clinical competence. Clinical outcomes were not collected in this study, so a correlation between actual clinical

competence and SE could not be made. Until outcomes are compared to SE causation cannot be inferred, and the relationship between outcomes and SE cannot be determined with any certainty.

Confidence in Clinical Reasoning

The purpose of the CRP questions was to identify the aspects of the hypothetico-deductive process that the participants perceived to either facilitate or impede their acquisition of clinical reasoning. The DAT student scores conveyed much higher confidence in comparison to medical student scores in the original research. The items that most medical students reported ease with were 'summarizing the main features of a problem' (73%), 'generating working hypothesis' (68%), and 're-evaluating hypotheses' (63%),[19] compared to 100%, 94.12%, and 82.35% of the DAT students, respectively. The most difficult processes reported by medical students were 'feeling at ease with the clinical reasoning process' (46%), 'managing a patient's problem' (45%), and 'applying clinical reasoning in patient care' (44%).[19] The percentage of participating DAT students who reported ease with the same processes was 82.35%, 88.24%, and 70.59%, respectively.

Comparison between AT professional's and medical student's CRP scores was made possible through the CRP. The medical students were completing their professional education and had limited clinical experience,[19] while the DAT students were practicing professionals completing post-professional doctoral training. A comparison of the change the medical students made over the course of a semester would be more applicable. Unfortunately, the original researchers of the CRP did not

collect data prior to the implementation of their CR unit and did not calculate the change that occurred.

Perceptions of Clinical Reasoning Ability

One aim was to determine if the DAT course work had an effect on participant perceptions of clinical reasoning over one semester. Respondents' LCJPS-mod scores indicated an overall statistically significant change in perceptions of clinical reasoning abilities over the semester ($p<0.042$, 95% CI=-8.06, -0.18). Researchers who have used the original LCJPS to assess nursing students' change after completing patient simulations or directed clinical reasoning courses reported average change over a semester to be 2.31 and 3.81 total points.[18,22-23] The total average change for the participants of this study was 4.12 points.

Significant correlations were found between the scores of the LCJPS-mod and the other portions of the survey, specifically the CRP, SE, SE compared to entry-level, and SE compared to expert (Figure 5). Correlation to an already validated tool establishes criterion validity; a measure of how well a set of variables predicts an outcome based on information from another set of variables. Powerful correlations between scores on each portion of the survey compared to the LCJPS-mod reflect successful assessment of CR perceptions.

Correlation

	CRP	SE	SE compared to Entry Level	SE compared to Peer	SE compared to Expert
LCJPS-mod	0.553	0.643	0.504	0.469	0.542
Significance (P)	0.026	0.007	0.046	0.078	0.030

Figure 5. Correlation between the LCJPS-mod and the other portions of the survey.

A reasonable supposition may be that years of experience as an AT or highest degree completed will have an effect on a clinician's confidence in the CR process or their CR abilities. Correlation calculations were attempted to determine relationships between total CRP, LCJPS-mod, and SE scores and years of experience, age, gender, and highest degree completed. To protect the identity of the participants, demographic answers were stratified, resulting in too few participants representing demographic categories. Statistical significance was not detected between any demographic variable and the elements of the survey and no clear trends emerged. Further research is needed to determine relationships between CRP, LCJPS-mod, SE and demographic variables.

The effects of paired demographics on elements of the survey were calculated. To determine the effect of age (fixed-factor) and gender, degree, or years of experience (co-variants) on the elements of the survey, ANCOVA was calculated. No statistically significant relationships were found. The highest variance calculated was the effect of gender and age on SE compared to a peer of the same years of experience (0.085, F= 2.439). Additional studies, with larger and more normally distributed sample size, are needed to determine the effect that demographic variables have on the CRP, LCJPS-mod, and SE.

Limitations

Confidence in clinical reasoning, perceptions of clinical reasoning ability, and self-efficacy of AT domain and content areas has not been previously studied in AT students or professionals in this manner. Therefore, there is not any research to

compare with the results of this study for consistency. The LCJPS has not been modified to fit other health care professions, nor has it been used in AT specifically. Attempts were made to validate the CRP by correlating it to the LCJPS, which has well established validity. Due to the modifications made to the tool, however, validity of the LCJPS-mod would also need to be independently established.

The unknown influences of clinical and other professional experiences on the student's perceptions of CR skills also posed potential limitations. Specifically, in determining SE compared to an expert, the participants' definitions of expert may be varied. Since expertise has not been defined in AT, participants may perceive expertise differently, and their definition of an expert may change during the semester.

The small sample size of the study also lends to its limitations. Statistical analysis for correlation between demographic variables and elements of the survey could not be determined with sufficient power, so a larger and more varied sample would be ideal. The lack of control group is also a limitation. A control group would give additional information about the comparative scores between groups, for example students in another post-professional doctoral program or professionals not in a degree program.

Future Research

Future research is needed to validate the SE, CRP, and LCJPS-mod for a wider use in AT at the professional and post-professional education levels. Repeat administrations of the survey at regular intervals over the course of the DAT program may shed light on what periods of time students experience increased or decreased change, and how specific content or clinical/professional experiences affect the

outcome. Correlation to curricular sequencing and other factors (e.g., practice setting, decision making skill, ethnicity, etc.) could be calculated once comparable data is established for students of the DAT program.

The survey could also be administered in programs of varying focus (e.g., theoretical, professional practice) and degree level (i.e., undergraduate, professional masters, post-professional masters, doctoral), as well as to professionals with a range of professional experience across several demographics. Comparing the scores of other participant groups could determine the influence of varying experiences on elements of CR. The distinction between degree types and students' resultant CR characteristics could be demonstrated.

The relationship between SE and clinical performance also needs to be studied. To determine if a relationship exists between actual clinical performance and SE, clinical outcomes or another measure of clinical performance need to be compared to clinician ratings of SE. Identifying a relationship between SE and clinical competence may allow clinicians to equate changes in SE to changes in clinical performance.

Conclusion

Clinical reasoning by athletic trainers is vital for effective and safe patient care,[2] as well as professional development toward advanced clinical practice. The findings of this study help us to better understand the change that occurs in the perceptions and confidence in CR of students in the University of Idaho DAT program. Students experienced a significant change in their perceptions of CR ability, perceived confidence in CR, and SE over the first full semester of DAT coursework and residency. High self-efficacy beliefs equate to improved performance so the development of post-

professional programs that enhance learner self-efficacy may lead to improved clinical competence. The results of this study demonstrate that students in a post-professional, clinically centered program experience increases in perceived CR abilities and self-efficacy. Further research is needed to compare the CR characteristics of students participating in a variety of degree programs. While no inference could be made to the types of reasoning being used in the students' practice, this study helps lay the foundation for future research in CR of AT, and represents the benefits clinicians experience toward advancement of their practice when completing coursework in clinically-centered post-professional doctoral program.

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Appendix 1

Plan of Advanced Practice, December 2012

Plan of Advanced Practice

Experience

As compared to most athletic trainers I got off to a slow start on my way to becoming an athletic trainer. I did not even know what an athletic trainer was until my second year of college as a division one athlete. However, looking back, nothing could have given me the ability I have to relate to my patients as much as the years I spent as an athlete competing at an elite level and dealing with injuries of my own. The experience I gained before I became conscious of my path to becoming an athletic trainer is more valuable to me than anything I have learned to this day. Not only do I have common ground to stand on with every patient that walks in my clinic door, but I have an unending supply of intrinsic motivation to learn and to provide the best care I can. However, my undergraduate degree did not leave me completely unprepared to begin pursuing athletic training. On the contrary, my emphasis in biomechanics and the research I was able to complete in the labs there absolutely shaped the way that I evaluate and treat my clients. I was able to build upon a sound foundation of anatomy and physiology, a growing passion for biomechanics, and hundreds of hours of strength and conditioning experience by beginning my masters degree and pursuing my certification in athletic training.

In my masters education I learned more about my professional self, or lack thereof, being on the other side of the profession for the first time. I was suddenly not being judged based on performance alone, but on politics, religion, personal beliefs, and every single word that came out of my mouth. It was a foreign environment and concept to me, and one that admittedly shattered me at times. However, it also gave me a new awareness and new goals, new things to work on. I found incredible mentorship that will outlast my career, and continued to grow my knowledge base. Ultimately it also gave me the ability to become a certified athletic trainer and to take my first job working alongside a renowned orthopedic surgeon. It was in his office that my very novice evaluation skills were quickly tested and improved, my patient communication became polished, my professionalism was appreciated, and my confidence was built back up. It was also while working in that setting that I realized how important it was to me to be part of the solution to people's complaints, and not just the identifier of them. I proceeded to take a job in my current setting among division one athletics. After a few short weeks I was bored with not learning anything. The opportunity arose to begin the DAT and while I was at first hesitant, I chose to make an investment in my future. Little did I know it would be the best decision for my present that I could have ever made. Now I am here: daily enlightened in a new way by simply testing hypotheses; daily challenged by questions I don't yet know the answers to; now with more tools than ever to reach my goals and continue making new ones.

Knowledge

I have completed certifications in the following areas: Certified Strength and Conditioning Specialist, Kinesio-taping, Muscle Activation Techniques, Instrument Assisted Soft Tissue Mobilization, Functional Movement Screen, McKenzie. I have pursued

knowledge and practice in the following areas: Myofascial Decompression, Proprioceptive Neuromuscular Facilitation, Active

Release Techniques. I have also presented at a few local conferences, authored a presentation for a colleague speaking at a national physicians conference, spoken as guest lecturer for two post-graduate programs, and been active politically at the state level as well as am pursuing NATA programmed training for those interested in serving within the governing body.

Philosophy

It is with the help of the DAT and a lot of reflection that I have been able to put my philosophy in to writing. While as a disclaimer I should note that it may evolve, and should, this at least is a start to better identifying my values, my vision, and my practice:

> The philosophy of athletic training that I, Lindsay Warren, am going to adopt maintains a heart for my patients, mind for best practice and integrated techniques, and spirit of purpose. I want to relieve pain, increase function, and help my patients better their quality of life in the most effective and efficient way possible while educating them on how to do the same. In order to do this I will be dedicated to the close critical analysis of my practice. I will continue seeking learning opportunities. I will invariably test and share my knowledge, I will strive to attain the qualities and characteristics of a scholar within my chosen areas of focus as they develop, and I will maintain a personal/professional life balance.

Strengths

Currently I am able to meet some of the objectives in my philosophy and am struggling with others. The following strengths and weaknesses are based on my current self-perceived ability to meet the guidelines of my philosophy.

- Seeing the whole picture, not only the obvious or point of pain
- Purposeful practice/decision making
- Avoiding the shotgun approach and treating efficiently
- Unafraid to try new skills

Weaknesses

- Joint mobilizations
- Professional Maturity
- De-personalizing work
- Knowing and meeting the needs of the coaches and staff
- Political action/volunteerism

Professional Future!

I want to ensure my dedication to each patient's individual needs and meet them where they are when they come to see me. I want to work in a multi-faceted way, incorporating different techniques and disciplines seamlessly, and truly utilizing integrated holistic medicine. I want to protect myself from my subjectivity by creating a checks and balances system centered around outcome measures in my evaluations and treatment. I also want to be accountable to other professionals that share my ideals and share the understanding that we are the key to bettering our profession. I want to better utilize my mentor. I want to become an advocate for change in our profession. I want to be available to other athletic trainers and students for help, discussion, learning.!

Areas of Advanced Practice!

Regional Interdependence. I will study the Janda Approach as well as Dynamic Neuromuscular Stabilization. I will be researching other techniques that utilize RI and will continue to write the framework of my practice based in this model. I will use a protocol established in the SFMA, treat my patients accordingly (not solely based on complaint but based on findings), and record data to share.!

This is the weakest point of my PoAP right now. I need to figure out a defined set of goals to accomplish that will lead me in the right direction. I would love help in this area specifically.!

Justification of Facilitating Goals!

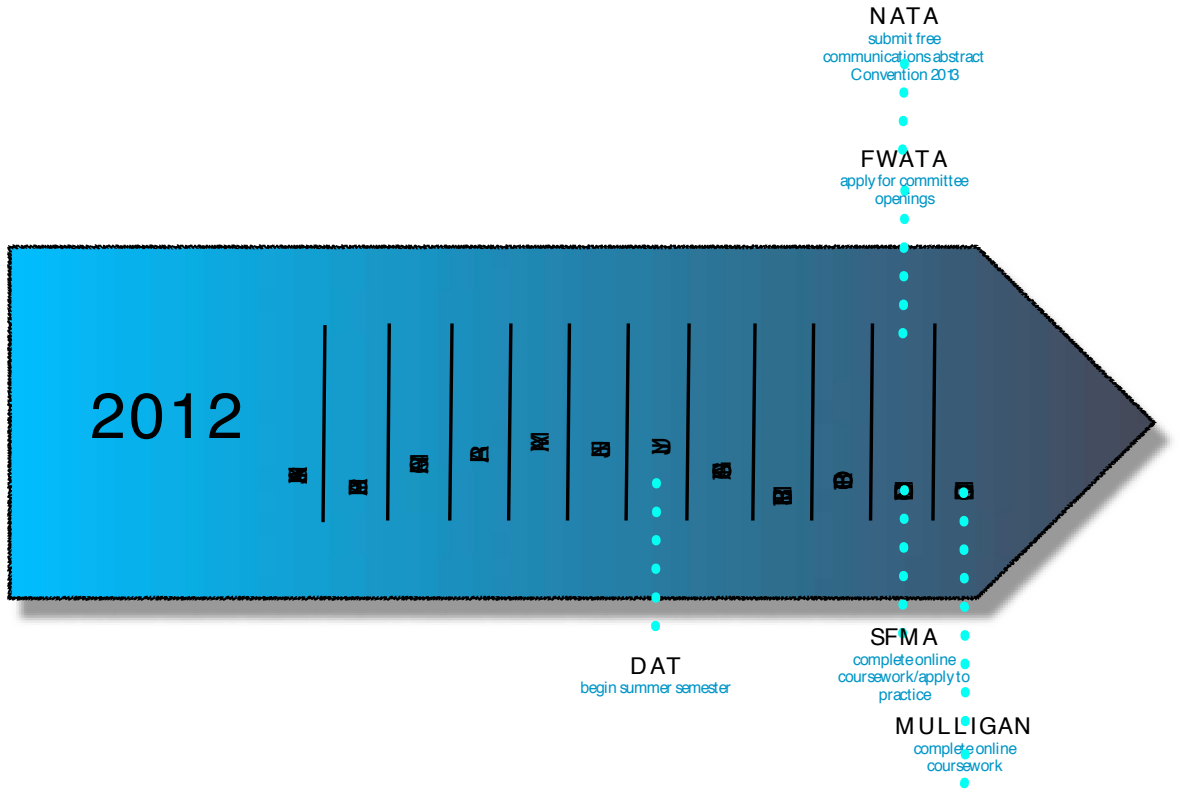
Simply having to take the time to think about each section listed above is a huge step in the direction of obtaining my professional goals. This may have been the hardest part- identifying and owning up to what I want to accomplish. One of my biggest fears as a student was getting sucked into my job so much that I became obsolete as a human being in the profession. Even as a student I could tell that there was a problem and that I didn't want to be a part of it. After only a few months of experience at the Division I level I could feel it creeping in on me. The DAT was going to be a way of escaping that. This only solidifies that initial thought. My plan will evolve and change, additions and subtractions will happen, but at the very least I feel accountable to it now. I am taking ownership of my career and the change I want to see in our profession through the development of my Plan of Advanced Practice.!

Timeline!

Daily: take time to reflect, utilize the SFMA in evaluations!

Weekly: Spend time reflecting, dedicate time to writing and sharing reflections on Wordpress, reflect on individual patient outcomes!

Monthly: phone/video conference with colleagues to discuss progress, patient care, etc.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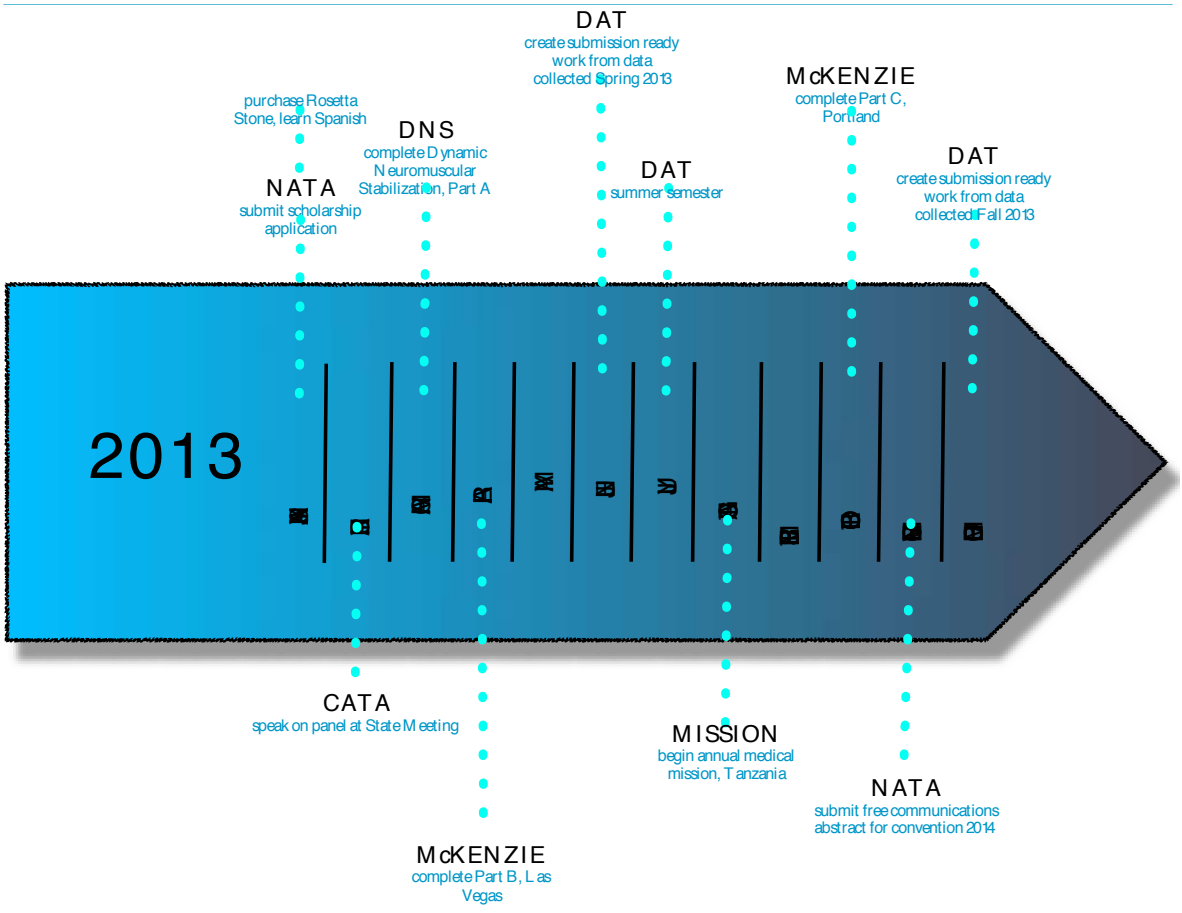
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CATA
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McKENZIE
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MISSION
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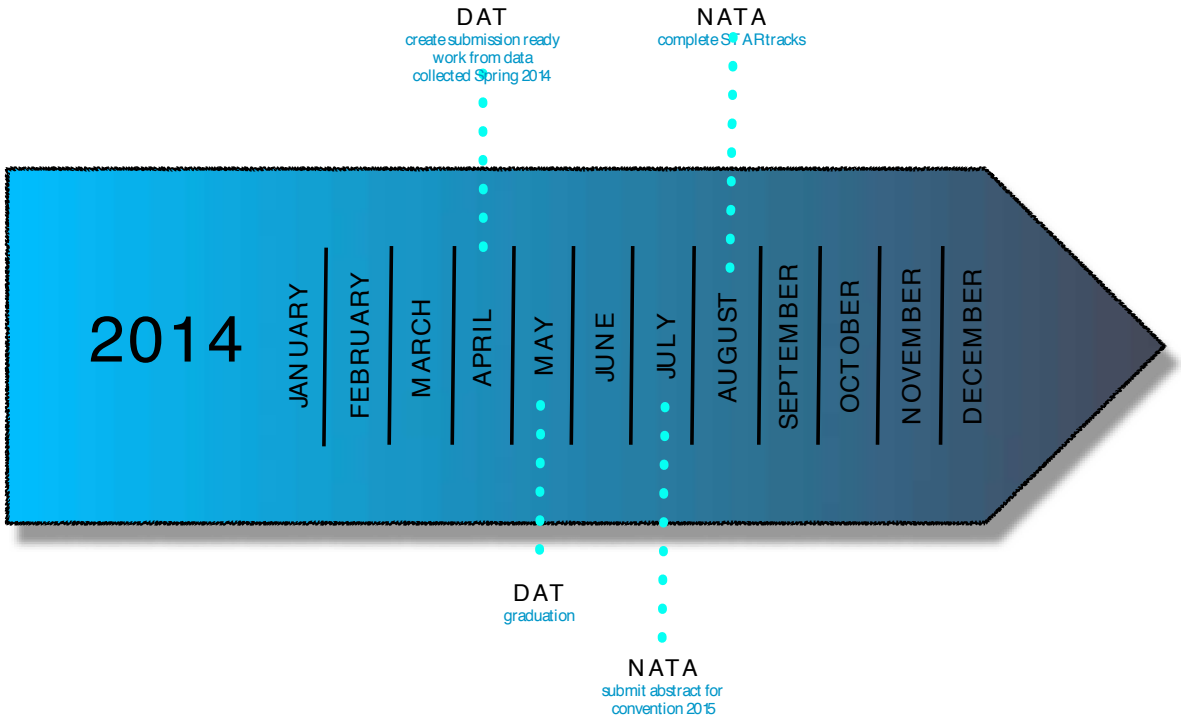
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Appendix 2

Poster Presentation: Functional Restoration from Trochlear Dysplasia using the Selective Functional Movement Assessment: A Case Study

Functional Restoration from Trochlear Dysplasia using the Selective Functional Movement Assessment: A Case Study

Lindsay Warren, MS, ATC, CSCS*, Russell Baker, DAT, ATC†, Jolene Baker, EdD, ATC*, Nicole MacDonald, DrPH, ATC, CSCS*
*California Baptist University, Riverside, CA, †University of Idaho, Moscow, ID

ABSTRACT

Background: An 18 year old male college freshman with chronic patellar dislocation, due to bilateral trochlear dysplasia, presented to the clinic after complications following right trochleoplasty and surgical restoration of the medial patellofemoral ligament 3 years prior (Dec, 2009). Because of the procedure he was no longer able to participate in his sports, baseball and football. Four weeks following initial surgery to his right knee he sustained a patellar fracture while jump roping. Two screws and a length of wire were used to repair the patella. The patient suffered from chronic swelling and bursal irritation so the wire was removed August 2013. He reported to the clinic 4 weeks after that procedure. Examination in the clinic revealed major atrophy of the right thigh musculature compared bilaterally. No tenderness was reported but the patient had pain 4/10 on the Numerical Rating Scale (NRS) at the end range of his available active knee flexion (127) and reported pain 7/10 on the NRS with activity, findings of patho-anatomical exam were otherwise unremarkable. Neurological screen was normal for strength and sensation, except for a small area of parasthesia immediately surrounding the surgical scar, which is to be expected. Differential Diagnosis: Somatic dysfunction, myofascial restriction, neurological deficit, psychosocial implications. Treatment: Selective Functional Movement Screen (SFMA) was performed, showing: spinal weight bearing stability or motor control dysfunction, thoracic extension stability or motor control dysfunction, right knee joint mobility or tissue extensibility dysfunction, proprioceptive deficit at the right ankle. Disablement in the Physically Active (DPA) scale and girth measurements were also recorded. Treatment included Mulligan mobilization with movement, core motor control training, instrument assisted soft tissue mobilization, and psychosocial intervention. 7 treatment sover the course of 4 weeks lead to the full restoration of function, DPA scale decreased from 28 to 2, and the patient gained a total of 10.5 cm of girth. Uniqueness: Trochlear dysplasia is rare and considered to be an under diagnosed cause of recurrent patellar dislocation, especially in children and adolescents. The SFMA is not currently well established in the literature, and was used to evaluate and monitor change. Lastly, the clinical integration of several treatment paradigms sets this case apart from others. Conclusions: This case suggests the utility of the SFMA for a complex patient presentation, and provides todder for additional research. It further explores the use of several treatment paradigms as part of a purposeful plan for whole patient care.

CASE REPORT

An 18 year old male college freshman reported to the clinic with a complicated history of bilateral knee issues. Since a young age he suffered from chronic bilateral patellar dislocations. With each occurrence he felt significant pain and general joint swelling that would resolve with 7-10 days of rest, after which he would return to normal activity. He was able to participate in football, baseball, and soccer through his sophomore year of high school. In 2009, at the age of 15, he sustained a significant right patellar dislocation while playing soccer, which also damaged his medial and lateral menisci. A few weeks later, he underwent a right trochleoplasty, surgical restoration of the medial patellofemoral ligament, partial menisectomy, and meniscal repair. Four weeks following the procedure, he fractured his right patella while jump roping as part of his rehabilitation. The patient underwent immediate surgery to repair the patella. Two 2-inch screws and a length of wire were used to form a cage that secured the fractures. He rehabilitated in the months following, but reports never feeling that he recovered his strength, coordination, or endurance. Due to the secondary injury, he was no longer able to participate in sports or the extracurricular activities that he enjoyed. Additionally, the patient suffered from chronic bouts of joint swelling and bursal irritation from the wire and screws. In August of 2013, the wire was removed. It was 4 weeks after the removal of the wire that the patient reported to the clinic.

Examination revealed major atrophy of the right thigh musculature when compared bilaterally. No tenderness was found upon palpation, but the patient reported pain 4/10 on the Numerical Rating Scale (NRS) at the end range of his available active knee flexion (127°) and reported pain 7/10 on the NRS with activity. Findings of the patho-anatomical examination were otherwise unremarkable. Neurological screen was normal for strength and sensation, except for a small area of parasthesia immediately surrounding the surgical scar, which is to be expected with his past surgical history. Also revealed through a thorough history was the patient's embarrassment about the atrophy and size differential of this thighs. He also expressed anger and frustration with his injury, the lack of resolution, and his inability to remain active at the level he would like.

Selective Functional Movement Screen (SFMA) was performed showing: spinal weight bearing stability or motor control dysfunction (SMCD), thoracic extension SMCD, right knee joint mobility or tissue extensibility dysfunction, and proprioceptive deficit at the right ankle. Disablement in the Physically Active (DPA) scale and girth measurements were also recorded.

TREATMENT

The patient-centered goal for treatment was to return to snowboarding for the upcoming ski season, approximately 6 months from his initial visit. The clinician-centered goals for treatment were to treat the somatic dysfunction by restoring full range of motion and strength of the right leg, instilling confidence in the patient to return to previously avoided activities when appropriate, and giving the patient self-directed tools to decrease central nervous system up-regulation that may be contributing to his anger and frustration. Due to the complex nature of the patient's history, his chief complaints and frustrations, and the findings of the examination, an integrated intervention program was designed in order to reach both patient-centered and clinician-centered goals. Figure 1 is a visual representation of the clinician's clinical reasoning behind each intervention choice.

Several treatment paradigms were utilized. Treatments included Mulligan mobilization with movement (MWM), core motor control training, instrument assisted soft tissue mobilization (IASTM), a bike training program, and two psychosocial interventions: the Emotional Freedom Technique (EFT), and the Grateful Heart Technique.

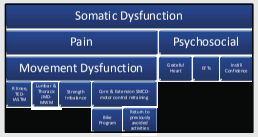


Figure 1: The integration of several interventions simultaneously for the treatment of patient's somatic dysfunction

RESULTS

Seven treatment sessions over the course of 4 weeks led to full restoration of pain-free function. The patient experienced strength increases and muscle growth, as measured by girth. Girth measurements were taken every 2 weeks at several locations above and below the knee (2, 4, 6, and 8 in. above the center of the patella and 2, 4, and 8 in. below the same point) (Figure 2). Because hypertrophy was expected in both legs with bike training, total girth was calculated by subtracting the gains in girth measured from the unaffected leg (left) minus the gains measured from the pathological leg (right). The total change in girth was 10.5 cm, as represented in Figure 3. The patient also experienced resolution of pain with knee flexion. Pain free active knee flexion was measured at the start of each treatment session. Figure 4 shows the range of motion change over the course of treatment, from 127°to 152°; a total change of 25°. The DPA scale was also measured at the start of each treatment session and decreased from an initial score of 28 to a final score of 2 over the four weeks of treatment (Figure 5). He returned to snowboarding at the first snow, 12 weeks after his initial visit to the clinic. At his three month follow up, the patient remained pain free and fully functional. He was able to continue snowboarding and participating in other extracurricular activities, including recreational sports and jet skiing, without pain or loss of function.

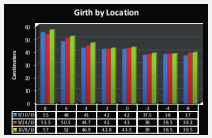


Figure 2: Girth measurements taken on 3 occasions at locations above (8, 6, 4, 2 inches), in line with, and below (2, 4, 6 inches) the patella

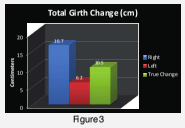


Figure 3

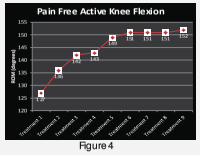


Figure 4

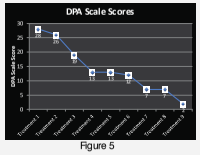


Figure 5

DISCUSSION

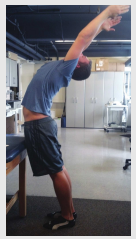
Trochlear dysplasia is rare and considered to be an under diagnosed cause of recurrent patellar dislocation, especially in children and adolescents. Treatment is usually surgical in order to restore the trochlear grove. Surgical reconstruction of the medial patellofemoral ligaments is also recommended in cases which medial knee stability has been compromised. In this case, the subsequent patellar fracture further complicated the case. Because incidence rates of patellar fracture after surgery is not documented in the literature, it is also plausible to consider it a rare occurrence. It should be considered a risk factor in patients undergoing medial patellofemoral reconstruction. More research is needed in this area.

The SFMA is also not currently well established in the literature. It was not only used for evaluation of movement dysfunction, but also to evaluate and monitor change. Full function was considered restored when the patient was functional and non-painful in all movements outlined in the SFMA. Due to the lack of evidence surrounding the utility of the SFMA, its sensitivity and specificity is unknown. One limitation of this case was that it relied heavily on the SFMA to identify dysfunction. If the SFMA is not sensitive enough to be used in this way, it is possibly that some dysfunction was not found or treated. However this is not suspected because of the patient's outcomes with treatment. The patient experienced full restoration of range of motion, strength, and function, was pain free and able to return to activity without limitations, suggesting the value of the SFMA as an evaluation tool and patient outcome measure.

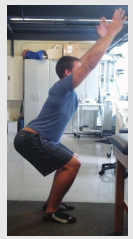
Lastly, the clinical integration of several treatment paradigms sets this case apart from others. Each of the interventions used had a specific purpose in the whole-person care of this patient. While research commonly evaluates the use of a single intervention, clinical practice often requires more than a single intervention be used. The purposeful use of several treatment interventions differs significantly from the "shot-gun" approach of using several treatments in the hopes that one might help. An integrated approach, such as this one, is focused on whole patient care, and each intervention is evaluated through specific patient outcomes measures.

CONCLUSION

Lastly, the clinical integration of several treatment paradigms sets this case apart from others. Each of the interventions used had a specific purpose in the whole-person care of this patient . While research commonly evaluates the use of a single intervention, clinical practice often requires more than a single intervention be used. The purposeful use of several treatment interventions differs significantly from the "shot-gun" approach of using several treatments in the hopes that one might help. An integrated approach, such as this one, is focused on matching interventions to specific problems or classifications in a patient-centered approach to care.



Multi-segmental extension movement assessment



Overhead squat movement assessment

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Appendix 3

Poster Presentation: Knowledge and Readiness of Inter-Professional Education in Athletic Training and Nurse Practitioner Students: A Pilot Study

Knowledge and Readiness of Inter-Professional Education in Athletic Training and Nurse Practitioner Students: A Pilot Study

Nicole MacDonald, DrPH, ATC, CSCS, Jolene Baker, EdD, ATC, Lindsay Warren, MS, ATC, CSCS, Dayna Herrera, MSNed, RN, Lisa Bursch, DNP, RN
Department of Kinesiology and the School of Nursing, California Baptist University, Riverside, CA

ABSTRACT

Context: In 2003, the IOM and the WHO called for the development of interdisciplinary teams to increase healthcare quality and safety and urged healthcare educators to incorporate inter-professional education (IPE) routinely into the curriculum. Athletic trainers as healthcare professionals need to learn to practice as part of an inter-professional team. Objective: The objective was to determine athletic trainer (AT) and nurse practitioner (NP) students' knowledge and readiness for IPE, ability to define the roles and responsibilities of the respective disciplines, and work as part of an IPE team in caring for a patient. Design: Controlled intervention trial, with two groups: intervention, and control. Setting: Simulation lab at the School of Nursing at California Baptist University. Participants: Twenty entry-level Master of Athletic Training students and 8 Nurse Practitioner students. Data Collection and Analysis: The study was conducted around a simulated patient scenario. In the simulation, the AT students' goal was to respond to the scenario on the basketball court, provide immediate evaluation and care of the patient, then transfer care to a NP student at the clinic. The NP student would then perform their clinical evaluation and determine if any further treatment was needed. All 28 students were given a readiness questionnaire, Readiness for Inter-professional Learning Scale (RIPLS), to determine their knowledge of and readiness for IPE the day before the simulation. The day of the simulation students were split into two groups, those who would receive the intervention and those who would not. The students in the intervention group were allowed 30 minutes prior to the start of the simulation to review the simulation scenario and a written description of the respective disciplines and discuss them together. After the simulation all students were then given the RIPLS questionnaire again. The questionnaires were collected and analyzed for change in two ways: between intervention and control groups, and between pre and post questionnaire measures. Results: There was a significant difference found between the intervention and control groups on the RIPLS questionnaire given after the simulation (p=0.045) but not before the simulation (p=0.548). There were no significant differences found between pre and post questionnaires with either the intervention or control groups (p=0.129 and p=0.588, respectively). Conclusions: The students of the intervention group having foreknowledge of their respective roles were more prepared for the simulation as indicated by the significance in post-questionnaire results. The students of the intervention group had a more enriching experience and were able to work as a more cohesive medical team during the simulation. Although there were no statistically significant differences found between pre and post questionnaires within each group, the data suggests a difference may be recognized if the sample size were increased. This study revealed that there is a lack of knowledge of different healthcare professions' scope of practice, leading to the need for IPE in order to promote collaborative practice in athletic training with other professions.

BACKGROUND

In 2003, the IOM and the WHO called for the development of interdisciplinary teams to increase healthcare quality and safety and urged healthcare educators to incorporate inter-professional education (IPE) routinely into the curriculum. Interprofessional opportunities and socialization are critical features to the professional education of healthcare providers and are especially relevant in today's healthcare environment in which no practitioners practice in isolation.

The goals of IPE and Collaborative Practice (CP) are to increase patient outcomes and provide a more patient-centered environment. When the patient is at the center of their own health care, the healthcare system revolves around their needs rather than fiscal or space pressures. The patient doesn't necessarily get everything they want but the care is focused on the patient's goals and the professional expertise of the team. Interprofessional collaborative practice, as defined by the WHO (2010), is "when multiple health workers from different professional backgrounds work together with patients, families and communities to deliver the highest quality of care." This type of practice requires a climate of trust where providers can comfortably turn to each other to ask questions without worrying that they will be seen as unknowledgeable. The WHO organized a study group (2010) that developed a global framework (Figure 1) for action on IPE and CP and its goal was to show the role of preparation of a collaborative-practice ready workforce that is driven by local health needs and local health systems designed to respond to those needs. In response to the call to action by the IOM and the WHO, the Interprofessional Education Collaborative (IPEC, 2011) panel of experts developed four interprofessional collaborative core competencies (Figure 2) intended to provide common ground that would be relevant across professions to address the essential preparation of clinicians for IPE practice. These IPE competencies built on each profession's disciplinary competencies in defining goals for IPE practice and provided a foundation in which to develop educational programs that brought disciplines together. As the concept of IPE evolved, in 2012 the WHO stated that, "Interprofessional education occurs when students from two or more professions learn about, from, and with each other to enable effective collaboration and to improve health outcomes"

Recognizing the need for educational changes in athletic training, the document Future Directions in Athletic Training Education (2012) published by the NATA Executive Committee for Education included reference to IPE. The authors recommended the following: "Inter-professional education should be a required component in professional and post-professional education programs in athletic training." Then again in December 2013, a work group commissioned by the NATA Executive Committee for Education (ECE) in the publication, Professional education in athletic training: An examination of the professional degree level, key finding #6 stated, "Professional education at the graduate level should facilitate inter-professional education." Athletic trainers have historically practiced inter-professionally, but that has not been intentionally addressed in professional and post-professional education programs.

PURPOSE

The purpose of the present study was to determine athletic trainer (AT) and nurse practitioner (NP) students' knowledge and readiness for IPE, ability to define the roles and responsibilities of the respective disciplines, and work as part of an IPE team in caring for a patient.

Figure 1: Framework for Action

Figure 2: Core Competencies

METHODS

The present study was a pre-test, post-test intervention trial. The study was conducted around a simulated patient scenario in the School of Nursing simulation lab at California Baptist University. Twenty entry-level Master of Athletic Training students and 8 Nurse Practitioner students participated in the study. In the simulation, the AT students' goal was to respond to the scenario on the basketball court, provide immediate evaluation and care of the patient, then transfer care to a NP student at the clinic. The NP student would then perform their clinical evaluation and determine if any further treatment was needed. All 28 students were given a questionnaire, Readiness for Inter-professional Learning Scale (RIPLS) (Cronbach's $\alpha = 0.90$), to determine their knowledge of and readiness for IPE the day before the simulation. The day of the simulation students were split into two groups; those who would receive the intervention and those who would not. The students in the intervention group either participated in a previous simulation scenario (NP students) or watched the simulation scenario of a previous group (AT students). This group also received a 30 minute pre-briefing which included a discussion of a written description of the respective disciplines. After the simulation all students were given the RIPLS questionnaire again. The questionnaires were collected and analyzed for change in two ways: between intervention and control groups and between pre and post questionnaire measures. In addition, students participating in each individual simulation collaborated on the patient evaluation documentation and a debriefing questionnaire. Students were required to reflect on their own simulation as well as that of another group.

RESULTS

There was a significant difference found between the intervention and control groups on the RIPLS questionnaire given after the simulation (p=0.045) (Table 1) but not before the simulation (p=0.548). There were no significant differences found between pre and post questionnaires with either the intervention or control groups (p=0.129 and p=0.588, respectively). The ability to define the roles and responsibilities of the respective disciplines was demonstrated through discussions in the debriefing documents and portrayed in Table 2.

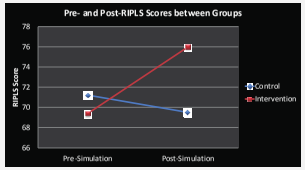

Table 1: Changes in readiness for IPE between the control and intervention groups

DISCUSSION

The students of the intervention group having foreknowledge of their respective roles were more prepared for the simulation as indicated by the significance in post-questionnaire results. Although there were no statistically significant differences found between pre and post questionnaires within each group, the data suggests a difference may be recognized if the sample size were increased. The students of the intervention group had a more enriching experience and were able to work as a more cohesive medical team during the simulation as evidenced by the student reflections.

The students identified the importance of understanding the scope of practice of the other provider as well as educating the other provider of their own scope of practice. They reflected that without this mutual understanding there was no foundation for trust and respect in one another's ability to provide quality patient care.

The faculty also conducted regular reflection throughout the planning and implementation of the IPE simulation. The need for a well thought out and descriptive patient case was clear prior to the simulation. After the completion of the simulation, the importance of pre-brief and de-brief was recognized. The students who received the pre-briefing exhibited better communication with all providers, increased confidence in their own abilities, and improved collaborative patient care. The de-brief provided all the students the opportunity they needed to discuss the experience with one another and better understand the implications of what they learned. This time also fostered the students' professional responsibility to educate others and advocate for the Athletic Training profession.

CONCLUSION

This study revealed that there is a lack of knowledge of different healthcare professions' scope of practice, leading to the need for IPE in order to promote collaborative practice in athletic training with other professions. Athletic trainers naturally collaborate with other healthcare providers as advocates for their patients; what is often overlooked is the opportunity to advocate for themselves. With greater intentionality, opportunities exist for athletic trainers to become leaders in IPE and CP in healthcare.

De-Brief Questions	Common Themes
What further information would you like to know about a NP?	• NP responsibility at the facility • NP access to resources • Differentiating between a nurse and a NP • NP scope of practice • NP specializations • NP needs when working collaboratively
What other information would the NP need to know about ATs that would have enhanced communication between the two practitioners?	• AT understanding of medical terminology • AT ability to take a full medical history • ATs are health care professionals with the tools and knowledge to respond to medical emergencies, take vital signs, and a patient's history. • AT role on site • AT scope of practice
What would have made your interaction and/or communication better?	• Defining roles and responsibilities of providers • Knowledge of where assistance is needed • AT identifying themselves upon presentation of patient • An establishment of a "head" to avoid confusion on who presents • AT confidence in skills and advocacy for the patient

Table 2: Sample of the common themes taken from several de-briefing questions

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Appendix 4

Poster Presentation: Utilizing Contralateral Exercise to Decrease pain and Increase Range of Motion in Four College Athletes: A Case Series

Utilizing Contralateral Exercise to Decrease Pain and Increase Range of Motion in Four College Athletes: A Case Series

Taylor Canatsey, Matthew Smitley, Lindsay Warren, MS, ATC, CSCS, Nicole MacDonald, DrPH, ATC, CSCS, Jodi Baker, EdD, ATC
Department of Kinesiology, California Baptist University, Riverside, CA

ABSTRACT

Background: This case series presents four student athletes who were treated with contralateral exercise. Patient one was a 19-year-old male basketball athlete with a chief complaint of constant low back pain with little change in severity over previous months. No clear mechanism/onset was reported, with varying results from special tests. Patient two was a 20-year-old male basketball athlete with a chief complaint of sharp pain over the left distal ulna. The patient experienced persistent pain over two weeks that was provoked with radial and ulnar deviation. Patient three was a 20-year-old male basketball athlete with a chief complaint of low back pain from a fall the day before. All trunk range of motion (ROM) was within normal limits, but patient reported pain with left trunk rotation and back extension from a full flexion position. Patient four was a 17-year-old female swimmer with a chief complaint of low back pain. The patient reported "shooting" pain from the right posterior superior iliac spine to mid biceps femoris muscle belly that lasted approximately 3 months. The patient also reported pain in trunk flexion. The patient was treated with chiropractic manipulations that helped decrease but did not eliminate symptoms. Treatment: Each patient was evaluated for perceived pain using the numerical rating scale (NRS) and ROM deficits using goniometry prior to treatment and again following treatment. Following initial evaluation, all patients were treated by performing active movements to the side opposite of their pain. Patients 1, 3, and 4 performed a combination of a single leg sit-to-stand maneuver and trunk rotation of the uninvolved side. Patient 2 performed ulnar and radial deviation of the uninvolved side. Specific outcome measures were ROM and perceived pain following treatment (1 set of 12 repetitions) each visit. Results: Significant changes were detected in ROM (p<0.0001) and pain (p<0.006) in all patients. Following contralateral treatment, bilateral ROM increased on average by 4°for all patients. Patient 1 gained an average of 12.81% (3± 1.3°; p<0.0001) bilaterally in straight leg raise, hip flexion, and hip extension after one treatment. Patient 2 gained an average of 9.33% (2.9± 4.2°; p<0.001) in ROM. Patient 2 gained an average of 13.22% (2.25± 0.96°; p<0.019) in bilateral radial and ulnar deviation and a decrease in pain by 3 points on the NRS. Following 3 treatments, the patient had gained an average of 9.08% (1.8± 0.94°; p<0.0001) each treatment and a complete resolution of pain. Patient 3 had a complete resolution of symptoms after one treatment. Patient 4 gained an average of 19.86% (9.67±4.1°; p<0.05) bilaterally in right straight leg raise, left hip flexion, and left hip extension and a 50% reduction in pain on the first treatment. Following 3 treatments, the patient had increased 28.32% (7.2± 13.7°; p<004) across all ROM measures. Patient-reported pain using NRS decreased on average by 4 points (± 1.1, p<0006) for all patients after one treatment. . Uniqueness: Contralateral treatment is effective in improving patient-reported outcomes; however, it is rarely seen in clinical practice. This case series explores contralateral treatment as a valuable option for increasing ROM and decreasing pain. Conclusion: Contralateral treatments are effective in decreasing pain and increasing ROM. While ROM increases were moderate, an average decrease of 4 points is greater than what is required to produce a minimal clinically important difference (MCID) on the NRS (2 points). However, more research needs to be conducted to investigate the effects of contralateral exercise, and its combination with other manual-therapy treatments. Athletic training clinicians should keep an open mind when considering treatment options.

BACKGROUND

It has been common practice that treatment of any particular pathology requires the application of therapeutic modalities and exercise to the involved limb. Consequently, much time can be spent managing pain and other related symptoms before obtaining long-term goals. In addition, patients are often reliant upon the clinician for regular treatment and re-assessment of their progress. In 1894, Edward W. Scripture published research on the theory of cross-education. Finding changes in strength and accuracy after training a contralateral limb led to further research. In more recent years, Tom Dalanzo-Baker, supplemented Scripture's theory and developed a manual therapy technique called Total Motion Release (TMR). The TMR technique identifies and treats body imbalances reported by the patient through the use of contralateral exercise. Dalanzo-Baker's treatment strategy claims that patients are able to self-treat their pain and/or dysfunction with robust results. Research, of any form, is lacking in the TMR paradigm. However, there is an abundant amount of research pointing to the benefits of the theories surrounding TMR.

TMR is based on the concept of exercising the "good" side to make the "bad" side better. With much of human anatomy, there are often two-sides to the anatomy (e.g., right versus left limbs). In theory, normal movement and activities of daily living (ADLs) should be completed with the same amount of ease, speed, and range of motion when comparing bilaterally.

Once a patient displays movement dysfunction, or pain with a specific movement, symmetry is out of balance. Symmetry is defined as having the same amount of ease, speed, and range of motion when moving to one side as when moving to the other. Once the patient is evaluated, the "good" side, or side that moves with greater ease, is used for treatment. TMR establishes two options for treatment: treat with repetitions (10-20), or treat further and further into end range of motion (20-30 seconds). The patient should continue to perform sets of 2 until they are no longer improving.

Regional Interdependence (RI) "demonstrates how structures and functions far from the site of symptoms affect and influence pain and utility." Sturnce et al. state that RI refers to the concept that "seemly unrelated impairments in a remote anatomical region may contribute to, or be associated with, the patient's primary complaint." Additionally, RI helps support the premise of TMR in that, treating areas away from the site of pain will help identify and treat reported body imbalances.

PURPOSE

The purpose of this case series was to present results of the treatment of four patients utilizing contralateral exercise in decreasing pain and increasing range of motion and function.

METHODS

In application of procedures, this study utilized the theory set forth by Tom Dalanzo-Baker and his TMR philosophy. Outcomes were measured in the form of the Numeric Rating Scale (NRS), goniometric measurements, and the Disablement in the Physically Active (DPA) Scale. The NRS is a subjective measurement of the patient's reported pain on a scale of 0-10, 0 being no pain, and 10 being the worst pain imaginable for the patient. The DPA Scale is an objective measurement using a subjective questionnaire to determine the function in a patient. Norkin and White's Measurement of Joint Motion was referenced for all goniometric measurements.

CASE DESCRIPTIONS

Patient one is a 19-year-old male basketball athlete with a chief complaint of constant low back pain with little change in severity over previous months. No clear mechanism/onset was reported, with varying results from special tests. The patient was treated with one set of 10 repetitions of the trunk twist exercise in the standing, split standing, and seated positions.

Patient two is a 20-year-old male basketball athlete with a chief complaint of sharp pain over the left distal ulna. The patient experienced persistent pain over two weeks that was provoked with radial and ulnar deviation. Two treatments were administered in radial and ulnar deviation utilizing a 3-pound weight on the uninvolved side.

Patient three is a 20-year-old male basketball athlete with a chief complaint of low back pain from a fall the day before. All trunk ROM was within normal limits, but patient reported pain with left trunk rotation and back extension from a full flexion position. The patient was treated with utilizing two sets of 10 repetitions of the standing trunk twist and two sets of 10 repetitions of the single-leg sit-to-stand.

Patient four is a 17-year-old female swimmer with a chief complaint of low back pain. The patient reported "shooting" pain from the right posterior superior iliac spine to mid biceps femoris muscle belly that lasted approximately 3 months. The patient also reported pain in trunk flexion. The patient was treated with chiropractic manipulations that helped decrease but did not eliminate symptoms. The patient was treated on one occasion with sit-to-stand, sitting leg raise, and standing trunk twist.

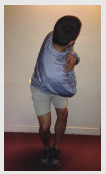


FIGURE 1:
Trunk twist in standing

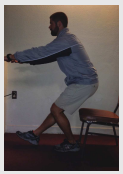


FIGURE 2:
Single leg sit-to-stand

RESULTS

Significant changes were detected in ROM ($p<0.0001$) and pain ($p<0.006$) in all patients. Following contralateral treatment, bilateral ROM increased on average by 4°for all patients. Patient 1 gained an average of 12.81% (3± 1.3°; $p<0.0001$) bilaterally in straight leg raise, hip flexion, and hip extension after one treatment. Throughout 5 treatments, patient one gained an average of 9.33% (2.9± 4.2°; $p<0.001$) in ROM. Patient 2 gained an average of 13.22% (2.25± 0.96°; $p<0.019$) in bilateral radial and ulnar deviation and a decrease in pain by 3 points on the NRS. Throughout 3 treatments, the patient gained an average of 9.08% (1.8± 0.94°; $p<0.0001$) in ROM and a complete resolution of pain. Patient 3 had a complete resolution of symptoms after one treatment. Patient 4 gained an average of 19.86% (9.67±4.1°; $p<0.05$) bilaterally in right straight leg raise, left hip flexion, and left hip extension and a 50% reduction in pain on the first treatment. Throughout 3 treatments, the patient had increased 28.32% (7.2± 13.7°; $p<0.04$) across all ROM measures. Patient-reported pain using NRS decreased on average by 4 points (± 1.1, $p<0.006$) for all patients after one treatment.

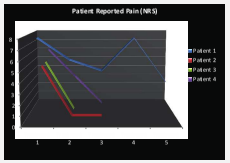


TABLE 1:
Patient reported pain scales post-treatment based on the Numeric Rating Scale.

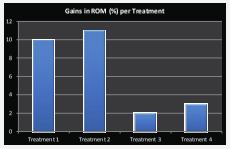
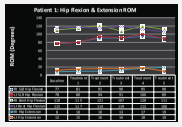
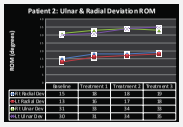
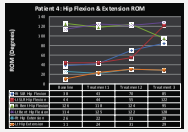


TABLE 2:
Percentage gains in range of motion per treatment for all included patients.







DISCUSSION

Based on the findings of this case series, there is merit in applying contralateral treatment to decrease pain and increase ROM. While ROM increases were moderate, an average decrease of 4 points is greater than what is required to produce a minimal clinically important difference (MCID) on the NRS (2 points). Additionally; these results combat the aforementioned notion that clinicians must always treat the involved limb. In the clinical application of contralateral exercise, pain-inducing therapeutic exercises have been avoided and pain management phase of treatment was expedited.

In many Athletic Training settings difficulty exists in the management of injury due to a high patient volume. The demand for quality care and time spent with each patient becomes less attainable due to the lack of patient compliance and volume of patients. The nature of TMR promotes self-treatment which in turn increases patient compliance and decreases reliance on the clinician. Patients then share in the responsibility to bring their body back to balance and decrease their symptoms. In experiencing positive outcomes, patients then comply with their treatment using contralateral exercise. The TMR approach allows for lower time demands on the clinician. Clinicians are able to provide quality care even with a high volume of patients as is common in Athletic Training.

CONCLUSION

At first glance, contralateral exercise is an unusual treatment approach, but has been found effective in this case series in improving patient-reported outcomes. The implications of this study suggest Athletic Training clinicians keep an open mind when considering treatment options. More research needs to be conducted to investigate the effects of contralateral exercise alone and in combination with other manual-therapy interventions.

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Appendix 5

Poster Presentation: Positional Release Therapy and its Affect on Running Economy in Male Collegiate Runners

Positional Release Therapy and its Effect on Aerobic Capacity in Male Collegiate Runners

Isabel Archuleta, ATC, Christina Brekelmans, Nicole MacDonald, DrPH, ATC, CSCS, Lindsay Warren, MS, ATC, CSCS, Jolene Baker, EdD, ATC
Department of Kinesiology, California Baptist University, Riverside, CA

ABSTRACT

Context: The goal of the study was to determine the effect of treating the tender points of the ancillary muscles associated with breathing while running with positional release therapy (PRT) and defining its effect on aerobic capacity of male collegiate runners. Objective: The main objective was to determine if a significant difference exists in aerobic capacity and RPE when the subject is treated with positional release therapy as a performance intervention. Design: Each subject received both a sham treatment and a PRT treatment separated by 3 days. The order in which subjects received each treatment was randomly assigned using Quick Calcs. The subjects were blind to which treatment they were receiving. The sham treatment required the clinician to palpate each tender point for 2 minutes with no shortening of the muscle, while the PRT treatment required shortening of the muscle to the most relaxed position. Setting: The experiment took place in the California Baptist University exercise physiology lab. Patients: The researcher used 2 male collegiate runners both age 20. There was a tender point pain minimum according to the numerical rating scale (NRS) of 3/10 or 4/10 with a jump sign or 5/10 without a jump sign. Subjects were required to have no injury within the last 3 months. Interventions: Subjects' tender points were mapped and the three greatest points of tenderness were recorded on the NRE. Three tender points were either treated with PRT or given a sham treatment according to their random assignment. Each subject completed a modified Bruce protocol, submaximal, treadmill test on two separate occasions, 3 days apart. A Viasys metabolic cart was used to measure aerobic capacity, and rate of perceived exertion (RPE) was measured by the traditional Borg RPE scale. Main Outcome Measures: Measures of aerobic capacity (VO_2 in ml*kg*min), RPE, and ancillary muscle tender point pains before and after exercise were the variables collected. A paired T-test between intervention and sham treatment of each subject on aerobic capacity and RPE was used to interpret the data on Statistical Package for Social Science (SPSS). Results: There was no statistical significance between treatments on aerobic capacity ($p<.578$). Additionally there was no significant difference in RPE between treatments ($p<.434$). Conclusions: The results suggest that PRT may have no effect on aerobic capacity or RPE. This study contained pilot data and hasled the primary investigator to re-evaluate the protocol and sample population. Since the correlation was moderate between aerobic capacities, an increased sample size may yield greater significance. Further research should be done on a sample population who has identified upper thoracic pain or tightness while running. Furthermore, protocol would include a change in the intervention by treating only reported tender points by the subject.

BACKGROUND

Athletic performance requires optimal musculoskeletal function and joint range of motion (ROM). Myofascial restriction, tissue dysfunction, and tissue extensibility dysfunction are all related terms that can inhibit musculoskeletal function and joint ROM. At the 2004 Olympic games, myofascial pain/muscle spasm was the pathology most commonly treated by attending physiotherapists, followed by tendinopathy, ligament sprain, and muscle strain. Restrictions of the myofascial system are caused by micro-trauma to the muscle and fascia. When left untreated, patients experience stiffness, pain, and decreased ROM due to myofascial adhesions. Adhesions cause permanent changes in the tissue properties of collagen fibers.

Positional Release Therapy (PRT) is an indirect treatment, causing no pain or discomfort to the patient, which has the ability to restore normal tissue length and decrease pain. PRT has been used to treat acute, subacute, and chronic pain as well as somatic dysfunction in patients. Dr. Tim Speicher with the Positional Release Therapy Institute (PRT-i) purposed the Mechanical Coupling Theory (MCT), which describes chemical, neural, and metabolic influences such as inflammatory metabolites and neural discharge that cause decreased Adenosine Tri-Phosphate (ATP), increased Acetyl Choline, and tropomyosin binding with free calcium. The presence of inflammatory metabolites ultimately leads to the inhibition of uncoupling of myosin and actin filaments, and underlying somatic dysfunction.

Though Dr. Jones, D.O., first developed the therapy in the 1950's and later termed the technique as strain counterstrain (SCS), PRT-i continued the evolution of the technique with evidence based practice. Both techniques require the clinician to place the restricted tissue in the greatest state of relaxation or position of comfort (POC). Two key differences between PRT and SCS techniques are the evaluation and the fasciculatory response method (FRM).

The SCS evaluation requires a segmental evaluation, while PRT encompasses whole body mapping and evaluation. Included in both procedures, however, is the use of palpation. Palpation allows the clinician to feel the difference in tissue texture, tension, and the strength of the fasciculation as they move the insertion of the muscle towards the origin. A fasciculation is described as the tender point of the myofascial restriction that has begun to pulsate because uncoupling of myosin and actin filaments are being inhibited. The FRM is used during PRT treatment as an indicator to the clinician that the POC is being maintained.

PURPOSE

Clinical researchers suggest that endurance athletes (i.e., distance runners, cyclists) have similar tender points in the ancillary muscles, muscles that aid in inspiration and expiration. The purpose of this study is to determine the effect of reducing myofascial restriction by treating tender points of the ancillary musculature with PRT on the aerobic capacity of male collegiate runners. Our hypothesis is that aerobic capacity will increase and rate of perceived exertion (RPE) will decrease when participants are treated with positional release therapy. Thus far, PRT and its use in the athletic population has been lacking. This study aims to evaluate PRT as a performance intervention in collegiate runners.

METHODS

Two male collegiate runners with no injury in the last 3 months, reported to the California Baptist University exercise physiology lab on two different testing days. General information was collected including: weight, height, and age. Consent forms were signed prior to administering intervention and control tests. Subjects were instructed to remove any clothing in contact with their chest and lay supine on the treatment table. The primary investigator mapped and recorded tender points of the ancillary muscles through palpation. A tender point was defined by a patient reported pain on the numeric rating scale (NRS) of a minimum 5/10 or a 3/10 with a jump sign, a reflex pain avoidance response. After mapping, a control (sham) treatment was administered. The control treatment consisted of light pressure using two fingers by the clinician over a previously mapped tender point for two minutes. Tender points were then re-palpated for pain.

After receiving the control treatment, participants completed a 4-minute treadmill warm-up then a Bruce submaximal VO_2 test (Figure 1) while connected to a metabolic cart. During the submaximal test heart rate (HR) and Borg Rate of Perceived Exertion (RPE) was recorded every minute by the administrator. VO_2 was recorded by EMGworks 3.5. The patient was blind to HR and VO_2 data. After submaximal test was completed, participants completed a 4-minute cool down. Participants repeated the testing procedures 3-days following the control. The same protocol and settings were used for testing, but treatment included PRT in place of the sham treatment.

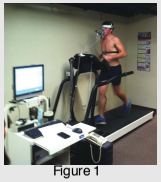


Figure 1

RESULTS

RPE and VO_2 ml/kg/min where averaged for each of the three stages in the Bruce protocol. Measured outcomes included aerobic capacity using VO_2, RPE using Borg scale, and ancillary muscle tenderness using 10-point Numeric rating pain scale. Results were separated into control and the PRT intervention for both patients, found in Table 1 and Table 2, respectively. Paired t-test was used to determine significant change between control and intervention data. There was no statistical change in aerobic capacity ($p<.578$) between control and intervention. RPE also did not change significantly ($p<.434$) between control and intervention.

Table 1

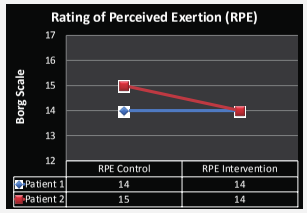
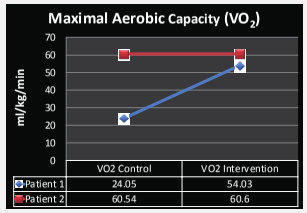


Table 2



DISCUSSION

The hypothesis was that there would be a significant difference in aerobic capacity after ancillary muscles were treated with PRT. The two participants did not experience significant change in aerobic capacity between the control and intervention. Unfortunately, due to the small sample size, statistical analysis from this pilot data cannot determine for certain if aerobic performance can be enhanced in the elite athlete with PRT treatment of the ancillary muscles.

Limitations of this study include sample size, population type, length of the study, and variables analyzed may not be appropriate in measuring performance. Making a significant difference in aerobic capacity of college or elite runners is difficult because the range in VO_{2max} is narrow, additionally one day of intervention may not be enough. The correlation between VO_{2max} and performance is not consistent; it is possible for two athletes with similar VO_{2max} to perform very differently. Further research should recruit more subjects, allow for multiple intervention sessions over a longer period of time, and other performance outcomes should be collected (race times).

CONCLUSION

Although there were not statistically significant findings the resultant data and procedural design of the pilot research is useful for future studies that aim to use PRT as a performance intervention. Additional research needs to be completed in order to determine if PRT is an effective tool in increasing performance outcomes such as aerobic capacity.

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Appendix 6

Poster Presentation: Arythmatic Right Ventricular Dysplasia Treatment and Management: A Case Report

Arrhythmogenic Right Ventricular Dysplasia Treatment and Management: A Case Report

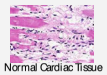
Shelby Daly, Jolene Baker, EdD, ATC, Nicole MacDonald, DrPH, ATC, CSCS, Lindsay Warren, MS, ATC, CSCS
Department of Kinesiology, California Baptist University, Riverside, CA

ABSTRACT

Background: This report presents the case of a 19-year-old collegiate female soccer player who had a near death experience and was subsequently diagnosed with arrhythmogenic right ventricular dysplasia (ARVD) in August 2011. She then underwent surgery for an implantable cardioverter-defibrillator. The patient only had one prior syncopal episode 8 months before diagnosis. The patient was practicing soccer alone when she began experiencing lightheadedness, loss of vision, and weakness causing her to call for help. She was found by the paramedics unconscious. In the ambulance her heart rate was 240 beats per minute indicative of ventricular tachycardia. She was diagnosed with ARVD and prescribed an ICD. She has had two episodes of ICD defibrillation since diagnosis. The etiology of the disease is a progressive mutation of the heart's desmosomes causing scarring of the myocardium when under mechanical stress, such as exercise. With the accumulation of scar tissue, the electrical conductance through the heart is not efficient leading to tachycardia. This in turn creates a decreased cardiac output and yields an insufficient blood supply. While family history of the disease was found on the maternal side, no clinical examination had been conducted prior to diagnosis other than pre-participation examinations (PPE). Nine PPEs had been performed on the patient from middle school to college. The evaluation procedures performed during all PPEs were not effective in discovering any cardiac abnormality because none included formal cardiac screening. Differential Diagnosis: Idiopathic hypertrophic subaortic stenosis, heart attack, myocarditis, endocarditis, cardiac dysrhythmias, heart failure, cardiomyopathy, rheumatic heart disease, congenital heart disease, cardiomegaly. Treatment: During evaluation, a positive EDG showed ventricular tachycardia, past family history of ARVD, and an enlargement of the right ventricle determined by echocardiogram. These factors lead to the eventual diagnosis of ARVD. Surgical implantation of an ICD was prescribed, which monitors heart rate and triggers defibrillation at a heart rate of 220 beats per minute. No medication was prescribed for eighteen months, however after multiple episodes Metoprolol 25 mg was prescribed once a day for a month. Following a visit to her primary care physician, a different medication, Sotalol 80 mg twice a day, was prescribed. To renew her prescription she has to complete an EDG and blood test every three months. The objective of treatment is to maintain a low heart rate which affects the duration and intensity of exercise. She is able to participate in low intensity cardiovascular exercise such as yoga and walking. Uniqueness: This case is unique due to the incidence rate of ARVD being 1 in 10,000 worldwide, accounting for 17% of all sudden deaths in the United States. Typical predisposing factors are young competitive athletes 20-30 years of age, predominantly male, that are genetically predisposed to inherit an autosomal dominant trait. This patient is distinctive in that she is female and was diagnosed at 19 years of age. Conclusion: The patient is expected to have a normal quality of life; however, she is unable to participate in competitive athletics or strenuous activities. By increasing requirements for PPEs and recommending more extensive cardiac screening, athletic trainers are on the front line on helping to prevent sudden death.

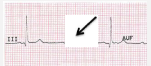
BACKGROUND

Arrhythmogenic Right Ventricular Dysplasia (ARVD) is a progressive disease that occurs in approximately 1 in 5,000 people and is usually diagnosed in patients between ages 20 to 30 years of age that are very physically active. Causes are unknown, but can be inherited genetically or caused by an infection which mutates a gene of the heart muscle. It appears that there is a mutant gene code in the proteins of the heart. The mutant proteins affect the desmosomes. Desmosomes help keep adjacent heart cells attached together and are crucial in maintaining the structural integrity of the heart. In ARVD, when the defective desmosomes are placed under mechanical stress (exercise), they detach from each other, leading to cell death. This cell death causes inflammation which produces a progressive replacement of normal tissue of the heart muscle fiber, the myocyte, with fat deposits and scar tissue. These fibrofatty islands predispose the heart to develop arrhythmias. Initially, the disease process is localized but gradually spreads to the rest of the right ventricle. The replacement of the normal heart tissue predisposes the individual to arrhythmias, an abnormal heart rhythm secondary to abnormal electrical activity of the heart. The diagnosis of ARVD is difficult because normal hearts have some degree of fat and fibrous tissue. ARVD is usually found at a young age between 20-30 years of age but is commonly found and diagnosed during autopsy. To manage ARVD one tries to prevent sustained ventricular arrhythmias and/or sudden death.



Normal Cardiac Tissue

ARVD Cardiac Tissue



ARVD Patient's Resting ECG with inverted T wave

CASE REPORT

Initial Diagnosis: August 2011

This report presents the case of a 19-year-old collegiate female soccer player who had a near death experience and was subsequently diagnosed with ARVD in August 2011. She was alone at a soccer complex where she started to experience symptoms of light headedness and difficulty breathing. She called her parents for help and when they arrived she was unconscious, unresponsive, and had labored breathing. Her eyes were open but she was not tracking. The ambulance was requested. Within a few minutes she was stimulated and began to awaken and became somewhat responsive, but was unable to recall any memory of the past few minutes. When in the ambulance it was noted that her cardiac rhythm, which resembled ventricular tachycardia, was at a rate of about 240 to 250 beats per minute. Her blood pressure was 71/35, respiration was 20 and SpO_2 was 100%. On the way to the hospital she converted to a sinus rhythm with multiple PVCs. In the emergency department her cardiac rhythm was in a sinus rhythm with multiple PVCs, 2 to 3 at a time. ECG appears normal except for an inverted T-wave in lead V3 and multiple PVCs, also some small Q-waves in lead 3. The patient had abnormal blood tests in potassium, CO_2, glucose, and creatinine; refer to Table 1. The patient was stable and medevaced to Anchorage. Her echocardiogram came back positive with enlargement of the right ventricle. She reported that there was family history of ARVD on the maternal side of the family. Her uncle was diagnosed with ARVD in 1984 after symptoms of dizziness and an episode of tachycardia, he was given beta-blockers as a therapy. However he was resistant in taking his medication. He had an episode February 1986 while jogging and he collapsed and was taken to the hospital. Two months later he was found dead at home after going on a jog, he was 27 years old. Her grandfather also reported having arrhythmias and was on beta-blockers. With a positive ECG of tachycardia, family history, and a positive echocardiogram these factors were indicative of an ARVD diagnosis. With this diagnosis she is unable to participate any contact sports for the rest of her life. She then underwent surgery for an implantable cardioverter-defibrillator (ICD). The patient only had one prior syncopal episode 8 months before diagnosis.

Table 1: Abnormal Blood Tests, August 2011

	Normal Blood Readings	Patient's Blood Readings August 2011
Potassium	3.5 - 5.1 mmol/L	3.2 mmol/L
CO_2	22.0 – 30.0 mmol/L	19 mmol/L
Glucose	65 - 99 mg/dl	180 mg/dl
Creatinine	0.52 – 1.04 mg/dl	1.2 mg/dl

Ambulance ECG

ICD on x-ray

Second Episode: October 2011

After diagnosis the patient experienced three significant tachycardic episodes. During October 2011 the patient experienced a shock from her ICD while playing volleyball. She reported that she was playing at a high intensity and for about 30-45 minutes. The only symptom she experienced was light headedness followed by being shocked and collapsing to the floor. She described the shock as being hit in the back by a volleyball during a hard serve. Once she was able to find a land line she was able to interrogate her device and send the information from the incident to her doctor.

Tachycardic Event with ICD Defibrillation

Third Episode: November 2012

A third event occurred in November 2012; the patient reported the week prior as being highly stressful. She walked up two flights of stairs to her roommate's room, where they were talking and the patient was laying on her bed. After about 3 minutes she began to have labored breathing and her chest tightened. She tried to correct the breathing, but then she started having strong palpations in her chest. She laid down on the floor when her defibrillator went off. This shock was much more painful than her first episode. After this episode she was having symptoms of anxiety. The doctor prescribed Metroprolol 25 mg once a day and Lorazepam 0.5 mg as needed for anxiety. Once she went home for winter break she met with her primary doctor who changed her medication to Sotalol 80 mg every 12 hours.

Tachycardic Event before Defibrillation

Fourth Episode: February 2014

The patient had a recent episode of tachycardia February 2014 due to natural causes. She was sitting at lunch when she experienced a surge through her body and her vision narrowed. She checked her heart rate and her resting heart rate was 180 beats per minute, but she was not shocked. It gradually lowered to a somewhat normal resting heart rate of 89 after an hour. She was transported to the ER where an ECG recorded her heart rate at 215 beats per minute. She was in and out of tachycardia for two hours. The ER personnel administered different medications to help lower her heart rate, which they did not. An electrophysiologist had to come in and interrogate her ICD and manually pace her out of the tachycardia by being cardioverted into a normal rhythm. She was prescribed a stronger medication of Amiodarone 200 mg, Atenolol 25 mg, Mexiletine 150 mg every 12 hours. It was also suggested that she should consider having an ablation procedure which would cauterize the scar tissue and lower the risk of her heart rate going array. After three weeks she had a follow up appointment to interrogate her ICD to check if she had any other episodes. The only episode she had was the night she was released from the hospital. She counted 12 pacings in 30 minutes and the interrogation showed that she was having an episode for over 2 hours. The doctor put her back on Sotalol 80 mg every 12 hours and Mexiletine 150 mg every 8 hours.

ICD Pacing during Tachycardia

TREATMENT

Surgical implantation of an ICD was prescribed, which monitors heart rate and triggers defibrillation at a heart rate of 220 beats per minute. There is usually a two chamber lead installed, but because she was not experiencing atrial fibrillation she only had a one chamber lead installed to her ventricle. Through her treatment she was eventually prescribed beta-blockers and anti-arrhythmia medication. Metoprolol 25 mg, Sotalol 80 mg, Amiodarone 200 mg, Atenolol 25 mg, Mexiletine 150 mg. After her most recent episode her ICD tolerance was lowered to 150 beats per minute. She is required to have an ECG, ICD interrogation, and blood test every three months to check on the progression of the disease. The patient's quality of life will be normal. She has had to implement some lifestyle changes. In her diet she needs to make sure that her Potassium, Magnesium, and hydration are kept at more than normal levels, her alcohol intake should be in moderation, and no caffeine. She needs to keep a low stress life, and get normal amounts of sleep. Illness may increase arrhythmias and should be avoided as best as possible.

DISCUSSION

This case is unique due to this patient being female and not experiencing sudden cardiac death. The male-to-female ratio of ARVD is 2.7 to 1. This patient is also distinctive in that she had over nine pre-participation exams (PPE), all showed negative findings for a cardiac disease even with an abnormal heart beat and family history of arrhythmias. The incidence rate of ARVD is 1 in 10,000 worldwide, accounting for 17% of all sudden deaths in the United States. However, the exact prevalence of ARVD cannot be determined because a large number of cases are clinically unrecognized due to asymptomatic patients or those that are diagnosed post mortem. Typical predisposing factors are young competitive athletes 20-30 years of age. For Athletic Trainers this is an important subject to be aware of because it is the target population that most Athletic Trainers work with. The first signs are usually found when the athlete experiences sudden cardiac death and is diagnosed with ARVD at autopsy. By making Athletic Trainers more involved in the screening process for cardiac diseases it could prevent and lower the amount of deaths from ARVD or other cardiac conditions. One of the predicting values of ARVD is an inverted T-wave. Because of this distinctive ECG wave it creates a more meaningful procedure to use an ECG as a screening technique to help identify ARVD in early stages. In San Diego the Eric Paredes Save a Life Foundation provides free cardiac screenings to young athletes. The screenings are relatively fast and are provided by cardiologists, physicians with nurses, and medical technicians and include a health history questionnaire, an ECG, and if needed, an echocardiogram for further testing. It is estimated that 1 in 350 teens in the United States have an underlying heart condition that can put them at risk of Sudden Cardiac Death. In Table 2 it can be seen that by doing ECG screenings there is a significant number of teens that have been screened and are positive for cardiac abnormalities or are at cardiac risk. Through the foundation they have been notified about their cardiac health status and have hopefully taken the next steps to diagnose and treat their condition. This foundation has shown that cardiac screenings are essential in pre-participation exams. However, because cardiac screenings are not required in PPEs and there is a number of teenagers that are at risk for cardiac complications, it is important that AEDs are readily available to Athletic Trainers and in public places. By increasing requirements for PPEs, recommending more extensive cardiac screening, and having readily accessible AED's, Athletic Trainers are on the front line to help prevent sudden cardiac death.

Table 2: Eric Paredes Save A Life Foundation

Screening Year	Teens Screened	Abnormalities Found	At Risk
2010	961	31	11
2011	2,699	64	30
2012	2,155	51	25
2013	3,924	67	33
2014	432	14	5
Total	10,171	227	104

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Appendix 7

Poster Presentation: Injury Rate of Dancers and Need for Athletic Trainers in Dance Programs

Injury Rate of Dancers and Need for Athletic Trainers in Dance Programs

Holly Hartley, Erin Bremond, Nicole MacDonald, DrPH, ATC, CSCS, Jolene Baker, EdD, ATC, Lindsay Warren, MS, ATC, CSCS
Department of Kinesiology, California Baptist University, Riverside, CA

ABSTRACT

Context: A dancer's bones, muscles, joints, and ligaments are placed under an enormous amount of stress. Dance is seen by many people as a hobby or an after school club, not a practice or discipline; therefore producing many potential injuries that are often left unattended. Dancers are aesthetic athletes making them able to mask injury, pain and dysfunction from the public eye. Athleticism is measured by the athletes' motor control, coordination, muscular strength, endurance, flexibility, speed and readiness; all of these attributes are needed for optimal dance performance. Athletic trainers are equipped with the specific knowledge base and skills in order to provide care for the whole injured population, including dancers. Objective: The objective of this review was to determine the injury rate of dancers and the need for athletic trainers in the collegiate setting. Data Sources: A database search was conducted in Dovepress, MEDLINE, CINAHL complete, PubMed, HealthSource, and SPORTDiscus. Keywords included: Dance medicine, pain, injury, dance, collegiate athlete, professional dance, and exertion. The search was limited to research published from 1970 to present day. Study Selection: The literature was searched for studies with Oxford Centre of Evidence-Based Medicine (CEBM) Level 3 evidence or higher. Eight studies were identified and appraised for inclusion in this review. Data Extraction: This review was organized by type of study and objective of the review. Each study was appraised according to the Quadas, and Strobe appraisal checklists. Data Synthesis: The data extracted showed that dancers experience 4.4 injuries per 1000 hours of dance class and that individual dancers average 6.8 injuries per year. Injuries were mostly classified as overuse injuries (64%); however, lower extremity and lumbar spine injury were also identified. The injury severity was averaged between 5–10 days for both female and male high-level dancers. There were very few studies identified examining the use of athletic trainers in collegiate dance programs. One study appraised recognized the need for athletic trainers but acknowledged that there is a misperception of who athletic trainers care for. Conclusions: Based on the results of the studies examined, dance as a practice presents a high risk of injury. An intervention needs to be set in motion in athletic training clinics to reduce the risk of injury in high-level dancers. Future research should include collecting data regarding the risk of injury in dancers of all levels. Injury risk screenings, proper nutrition and involved costs of treatment should also be included. Since there are few studies examining the use of athletic trainers in collegiate dance programs, more research needs to be done in assessing the knowledge of the profession of athletic training amongst the dance community and the utilization of athletic trainers in injury prevention and treatment of dancers.

CLINICAL SCENARIO

Dance Medicine is the use of medical knowledge for the enhancement of treatment for musculoskeletal injuries sustained in dance. Similarities exist between Dance Medicine and Sports Medicine used in the Athletic Training clinic. Both fields focus on studying the abilities of active individuals and applying knowledge to improve performance and prevent and manage injuries and conditions. Anyone who spends time in a dance environment, whether it is teaching, rehearsal or a performance venue will have little doubt about the athleticism of dancers. However, Athletic Trainers have historically not been utilized in dance companies or with most collegiate dance teams. Athletic Trainers are well equipped to provide injury assistance in a dance environment. Because of its artistic component, dancers are clearly athletes in their own right. Unfortunately, within the beauty and lyrical qualities of dance, injury finds a way to become a part of the process.

Ballet, Modern and Contemporary dance are the three most popular forms taught and practiced in a collegiate dance program. This study compared these three different dance forms. Classical ballet has more structure and there is a specifically desired pattern of movement when performed. Footwear for ballet includes ballet slippers or pointe shoes and clothing includes wearing leotards and tights. Modern and Contemporary dancers typically do not wear shoes, and their attire may range from minimal clothing to street clothes. Ballet and modern dancers may suffer different injuries since the partner work performed in modern dance is much different than in ballet. Modern dancers perform with more upper-extremity weight bearing maneuvers on the floor than male dancers holding ballerinas in the air.

Dancers included in all three forms use practically every part of their body during a rehearsal or practice. The injuries seen in dance can be quite comparable with injuries seen in collegiate sports, even though the exact mechanism of injury may differ. Dancers tend to "dance through" their injuries rather than seeking health care providers. They are extremely diligent in their work ethic, dancing and performing up to 35 hours a week.

PURPOSE

The objective of this review was to determine the injury rate of dancers and the need for athletic trainers in the collegiate setting.

SEARCH STRATEGY

A database search was conducted in Dovepress, MEDLINE, CINAHL complete, PubMed, HealthSource, and SPORTDiscus. Keywords included were dance medicine, pain, injury, dance, collegiate athlete, professional dance, and exertion. The search was limited to research published from 1970 to present day. The literature was searched for studies with Oxford Centre of Evidence-Based Medicine (CEBM) Level 3 evidence or higher. Eight studies were identified and appraised for inclusion in this review. This review was organized by type of study and objective of the review. Each study was appraised according to the Quadas and Strobe appraisal checklists. The articles included incidence of dance injuries between ballet, modern and contemporary.

Table 1: PICO Search

Patient/Client group	Dancers AND athletic trainers ballet OR modern OR contemporary
Intervention	dance medicine OR risk management OR self reported injuries OR prevention AND training
Comparison	injury rates AND types of dance
Outcomes	injury rates AND medical help OR prevention OR risk

RESULTS OF SEARCH

Out of the eight articles identified, four were utilized because they distinguished between various body parts and injuries amongst the three dance forms (See Table 2). Injuries among ballet and modern dance have received the most attention in the sports medicine literature. The percentage of participants affected is high; literature shows that it is not uncommon for 95% of dancers in a professional ballet company and 89% of dancers in a contemporary company to be injured. Table 3 provides the overall injury rates by percentage, categorized by body part and reported by the authors of the four studies analyzed. Injuries to the lower extremity account for the majority of all dance injuries, with most occurring in the ankle and foot. Other studies report that the trunk or lumbar spine compose about 20% or more of all injuries in dancers. Overuse injuries were found to be more common than traumatic injuries, because of the repetitive nature of dance practice and rehearsal.

Among the three forms of dance, all need special attention to the specific movements they use in their practice. It is common for dancers involved in each form to lack the tissue strength, flexibility and biomechanical capability that is necessary for them to be successful as a dancer. Dancers spend far more hours daily in the studio than traditional athletes spend on the field, court, or track. Particularly in ballet, requirements are very regimented and can be unforgiving to the musculoskeletal system. Ballet and modern dancers had the most differences, with more injuries occuring in the upper extremity since modern dance has more partner contact and upper body holds with jumping and rolling on the floor. Results compared between male and female dancers demonstrated that male dancers suffer more traumatic injuries and have a greater percentage of knee injuries, and upper and lower back injuries than females.

The four articles also included specific type of injuries occurring in dance, workload of dancers, and the dancer as a performing athlete. Baker et al. compared self reported injuries and reported injuries, by their appointed physiotherapist, among dancers. Results included the highest percentage between self-reported and reported injuries in the ankle and foot. Other similarities included a higher percentage of reported injuries in the lower leg than self reported. Further studies should include literature provided on psychology of dancers and the intense demand they hold upon themselves and whether or not they would utilize a health professional if available.

Table 2: Study Description

Study	Allen , et al	Bowling	Campoy, et al	Baker, et al
Dance Genre	Ballet	Ballet & Modern	Ballet & Contemporary	Contemporary
Level of Evidence	2	2	2	2

The data extracted showed that dancers experience 4.4 injuries per 1000 hours of dance class and that individual dancers average 6.8 injuries per year. Injuries were mostly classified as overuse injuries (64%); however, lower extremity and lumbar spine injuries were also identified. The injury severity averaged between 5–10 days for both female and male high-level dancers. There were very few studies identified examining the use of athletic trainers in collegiate dance programs. One study revealed the need for athletic trainers but acknowledged there is a misperception of the population cared for by athletic trainers.

DISCUSSION

Due to the high incidence of injuries in the three forms of dance, this study brings to light the need for dance medicine in the athletic training clinic. It has been established that dance, as a practice, sustains injury rates that are comparable, if not exceeding those of other sports. The most commonly injured areas of a dancer's body are in the lower extremity and practically mimic those of traditional sports. The injuries obtained by the dancers in the studies examined involved the ankles, knees, hips, and lumbar spine, with a large majority of the injuries being from overuse mechanisms.

In the collegiate athletic training clinics today there is an unnecessary disconnect between the injured dancer population and the capable certified athletic trainer. This disconnect occurs because many governing bodies, like the NCAA and others alike, label dance as a club or a hobby rather than a collegiate sport. This label placed on dance restricts the amount of care they can receive in the collegiate athletic training setting. Athletic trainers are well equipped with the knowledge base to provide preventative and rehabilitative care to dancers, however liability issues are currently eliminating dancers from getting the care they need.

Further research should examine the existing pre-disposing factors and the cumulative nature of dance injuries. More research using appropriate designs, such as sample sizes and the use of specific movements through dance forms is needed to investigate the effects of injuries and injury severity in ballet, modern and contemporary. Literature also needs to investigate the benefits of an athletic trainer within a dance environment in the prevention and management of dance injuries. Providing opportunities for dancers and athletic trainers to work together may be very beneficial in defining the roles of each and demonstrating the benefits of preventative measure against injury within the collegiate dance setting. The education and compliance of the dancer as a patient should be examined in order to prevent recurrent injury and create the environment for longer lasting careers. Finally the cost of treatment and care for dance injuries should be investigated as well as the required steps and situations that need to be in place in order for dance to be named along with the collegiate sports. This will allow athletic trainers to positively impact even more of the injured population then they are currently able to.

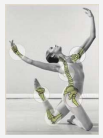

Table 3: Summary of Studies Reporting Injury Rates (%) in Dancers by Body

Study	Head & Neck	Upper Limb	Thoracic & Rib	Trunk & Hip	Lumbar	Knee	Lower Leg	Thigh	Ankle & Foot
Allen et al.	12%	6%	8%	5%	15%	5%	22%	12%	11%
Bowling	29%	6%	~	6%	26%	17%	~	16%	6%
Campoy et al.	~	34.5%	~	16.29%	~	43.62%	41.91%	55.42%	50.18%
Baker et al. (R)	~	7.7%	~	9.6%	15.4%	21.1%	9.6%	9.6%	26.9%
Baker et al. (SR)	~	12.5%	~	12.5%	5.4%	17.8%	21.4%	3.6%	26.8%

The report by Baker et al. included both reported (R) and self-reported (SR) data combined.

CONCLUSION

This study has showed that there is a significant injury rate for ballet, modern, and contemporary dancers and a need for Athletic Trainers to provide care for these individuals. Therefore, if Athletic Trainers can see soccer players and treat basketball players, dancers should be next in line. The amount of load placed on the joints and muscles of the upper and lower extremities of a dancer are substantial and are extremely comparable to other collegiate athletes.

The necessity for dance medicine within the athletic training clinic has been made apparent but the question still remains, will a dancer utilize the accessibility if provided? The fear of not being able to perform due to an injury may impede the willingness of dancers to take advantage of the care available from an athletic trainer. There may be a misunderstanding by the dancers of the skills and abilities of the athletic trainer and the types of care that can be provided. In addition, the athletic trainer needs to have an understanding of the biomechanics and the specialized requirements of dance.

Through examination of the literature, prevalence of injury has been established in dance. Proper care needs to be made available to facilitate the dancers overall best performance. Athletic trainers who show genuine interest in dance as a physical and artistic activity could be the first steps to beginning a world wide change in athletic training and dance medicine.

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Appendix 8

Poster Presentation: Treatment of Iliotibial Band Friction Syndrome Utilizing Positional Release Therapy

Treatment of Iliotibial Band Friction Syndrome Utilizing Positional Release Therapy

Jillian Helvey, ATC, Lindsay Warren, MS, ATC, CSCS, Nicole MacDonald, DrPH, ATC, CSCS, Jolene Baker, EdD, ATC
Department of Kinesiology, California Baptist University, Riverside, CA

ABSTRACT

Background: This report presents the case of a 20 year old, female cross country and track runner diagnosed with Iliotibial Band Friction Syndrome. The patient reported complaints of increased pain over the lateral femoral epicondyle with irritation of the Iliotibial band (ITB) in the last month of her cross country season. She also displayed noticeable inflammation. The patient reported no previous history in her previous seasons. She stated her current pain as a 7 on the 0-10 Numeric Rating Scale (NRS) and during practice her pain would worsen until she could not finish her full running activity. Palpation revealed "jump signs" at Positional Release Therapy (PRT) Tender Points (TP) over the origin of the Tensor Fasciae Latae (TFL) muscle and where the ITB passes over the lateral femoral epicondyle with significant pain of 7/10 at the ITB and 6/10 at the TFL. Range of motion assessment was within normal limits in all directions, but pain was experienced with hip abduction and knee extension. Ober's test was positive for ITB tightness, and Trendelenburg's test was positive at the iliac crest indicating weakness in the hip abductors. The patient reported an initial score of 37 on the Disablement in the Physically Active (DPA) scale. Differential Diagnosis: Lateral collateral knee ligament injury, Patellofemoral pain syndrome, avulsion fracture, ITB tightness. Treatment: X-rays revealed a negative knee avulsion fracture. The patient was treated for a total of 3 minutes at the 2 tender points found during the initial examination. The initial PRT treatment reduced the TP from a 7 to a 0 where the ITB passes over the lateral femoral epicondyle and reduced the TP from a 6 to a 0 at the origin of the TFL muscle. The second treatment resulted in a decrease from a 6 to a 1 at the ITB and a 4 to a 0 at the TFL. Her third and last treatment reduced from a 2 to a 0 at the ITB and a 2 to a 0 at the TFL. After her third treatment and final examination, her pain had disappeared during practices and her DPA score had decreased to a 16. Follow-up examination a month and a half later indicated maintenance of the final measurements and a continued resolution of symptoms. Finally, the patient had a DPA score of 5. Uniqueness: To our knowledge, this is the first published report of using PRT to treat ITB Friction Syndrome. Additionally, this is an example of research that can be conducted by the practicing clinician to improve outcomes and create best practice. Conclusion: In the present cases, PRT produced an immediate clinically significant improvement as measured by the NRS and DPA scale. The treatment also permanently resolved the symptoms.

BACKGROUND

It has been suggested in the literature that overuse injuries account for 30-50% of the pathologies treated in sports medicine, yet an exact prevalence is not known. A patient presenting with pain and friction at the lateral femoral condyle and Iliotibial Band (ITB), has commonly been diagnosed with Iliotibial Band Friction Syndrome (ITBFS). The ITB is a fibrous band located at the lateral thigh where it originates at the iliac crest and insert sat the Gerdy's tubercle of the tibia. It is also considered one of the main stabilizers when running. ITBFS is more common in distance runners and endurance athletes and presents with ITB swelling pain and stiffness. It is important for clinicians to use clinical techniques that address the chemical, neural and metabolic factors of somatic tissue dysfunction.

Positional Release Therapy (PRT) is an indirect therapy designed to treat acute, subacute, and chronic somatic dysfunction. PRT uses tender points (TPs) and a position of comfort (POC) to relax the muscle-spindle mechanism by placing tissue in a relaxed shortened state. Dr. Tim Speicher expanded on this concept with the Mechanical Coupling Theory which states that the POC allows for the restoration of the local environment through increased oxygen transport, improved ATP production, decreased inflammatory metabolites, and efficient coupling of actin and myosin. The POC is held for a period of time, often 90 seconds, to facilitate restoration of normal tissue length and function. PRT is applied to the most severe TP first, followed by the more proximal or medial TPs prior to distal or lateral TPs, and then the area of the greatest accumulation of TPs. PRT has relatively few contraindications and offers the potential to effectively treat a variety of pathologies.

PURPOSE

The purpose of this case report was to assess the effectiveness of PRT in treating ITBFS. Questions included the following: (a) Do patients with ITBFS present with TPs? (b) Does PRT effectively decrease tenderness to palpation measured by the Numerical Rating Scale (NRS)? (c) Does PRT decrease the level of disablement as measured by the NRS and the Disablement in Physically Active (DPA) scale?

CASE REPORT

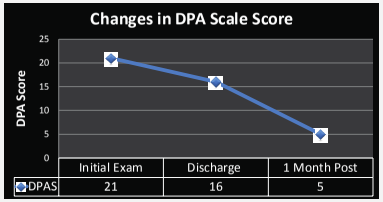
This case report involves a 20 year old, female cross country and track runner diagnosed with Iliotibial Band Friction Syndrome. The patient reported complaints of increased pain over the lateral femoral epicondyle with irritation of the Iliotibial band (ITB) in the last month of her cross country season. She also displayed noticeable inflammation. The patient reported no previous history in her previous seasons. X-rays were negative for a knee avulsion fracture. She stated her current pain as a 7 on the 0-10 Numeric Rating Scale (NRS) and during practice her pain would worsen until she could not finish her full running activity. Palpation revealed "jump signs" at PRT TP over the origin of the Tensor Fasciae Latae (TFL) muscle and where the ITB passes over the lateral femoral epicondyle with significant pain of 7/10 at the ITB and 6/10 at the TFL. Range of motion assessment was within normal limits in all directions, but pain was experienced with hip abduction and knee extension. Ober's test was positive for ITB tightness, and Trendelenburg's test was positive at the iliac crest indicating weakness in the hip abductors. The patient reported an initial score of 21 on the Disablement in the Physically Active (DPA) scale.

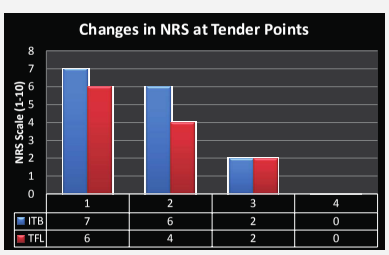
The patient was treated using only PRT after the conclusion of practice. The corresponding PRT technique was applied for a total of 3 minutes at the 2 TPs found. After treatment, the patient was allowed to return to normal activity without participation restriction. The patient was instructed not to perform any additional treatments (e.g., ice, stretching) or take any pain medications (e.g. acetaminophen, ibuprofen). PRT was applied for the second and third treatment and the patient was discharged following an asymptomatic re-examination that matched the initial exam. NRS scores were taken prior to and following each treatment, while DPA scale scores were recorded at initial exam and discharge.

RESULTS

The initial PRT treatment reduced the TP from a 7 to a 0 where the ITB passes over the lateral femoral epicondyle and reduced the TP from a 6 to a 0 at the origin of the TFL muscle. The second treatment resulted in a decrease from a 6 to a 1 at the ITB and a 4 to a 0 at the TFL. Her third and last treatment reduced from a 2 to a 0 at the ITB and a 2 to a 0 at the TFL. After her third treatment and final examination, her pain had disappeared during practices and her DPA score had decreased to a 16. Follow-up examination a month and a half later indicated maintenance of the final measurements and a continued resolution of symptoms. Finally, the patient had a DPA score of 5.

In this case, the patient experienced a clinically significant change on the NRS when reporting general pain, pain with palpation, pain with motion, and pain during manual muscle testing (MMT) following each treatment session. A clinically significant change was also experienced by the patient from initial exam to discharge as measured by the DPA scale. Additionally, the improvements were maintained from one treatment session to the next, at discharge, and at follow-up examination post-discharge (i.e., at end of season) without altering the patient's level of activity.





DISCUSSION

Currently, a "gold-standard" for treating ITBFS does not exist. A review of the literature indicates that the application of mechanical therapies (e.g., eccentric exercise, pulsed ultrasound, massage) can be effective treatments when applied over several weeks for reducing pain and dysfunction. Non-steroidal anti-inflammatories and other modalities (e.g., iontophoresis, continuous ultrasound, low-level laser) continue to be used with limited success. A clinician can evaluate the effectiveness of an intervention by determining if a patient has undergone a clinically significant change, as perceived by the patient, based on the change value represented by the minimal clinically important difference (MCID) for an outcome measure. The DPA scale has an MCID value of 6 points for patients with persistent injuries and an MCID of 9 points for patients with acute injuries. On the NRS, a 30% change or a reduction from baseline of 2 points is associated with a clinically important change. A clinician can generally conclude that a patient suffering from an acute injury has experienced a clinically significant change if a 2 point reduction on the NRS or a 9-point or greater change on the DPAS is reported following a therapeutic intervention.

In the present case, PRT produced an immediate clinically significant improvement and resolved the patient's symptoms in three treatment sessions. The patient was able to complete the entire cross country season and transition into track and field season without a return of pain or dysfunction. Further research is needed to determine the true effectiveness of this technique in the treatment of ITBFS, as well as on the mechanism that allows PRT to be a successful intervention.

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Appendix 9

Poster Presentation: The Effectiveness of Hip Strengthening to Address Patellofemoral Pain Syndrome in the Active Population

The Effectiveness of Hip Musculature Strengthening to Address Patellofemoral Pain Syndrome in the Active Population

Daniela Medina, Nicole MacDonald, DrPH, ATC, CSCS, Jolene Baker, EdD, ATC, Lindsay Warren, MS, ATC, CSCS
Department of Kinesiology, California Baptist University, Riverside, CA

ABSTRACT

Context: Patellofemoral pain syndrome (PFPS) is one of the most common knee pathologies affecting the physically active population. Traditional clinical intervention for PFPS includes strengthening primarily focused on the oblique fibers of the vastus medialis (VMO), yet recent studies have investigated hip muscle strengthening to improve symptoms and function of individuals with PFPS. Objective: The objective of this review was to discover the evidence for hip strengthening in improving function and decreasing pain for physically active individuals with PFPS. Data Sources: A database search was conducted in SPORTDiscus, Physical Education Index (ProQuest), Academic Search Premier, CINAHL and PubMed. Key words included: Patient, active or physical; Intervention, hip strengthening or hip exercise; Outcome, decrease pain or decrease symptoms or increase muscle strength. The search was limited to research published in the past 10 years that used human subjects. Study Selection: The literature was searched for studies with Oxford Centre of Evidence- Based Medicine (CEBM) Level 1 evidence. Inclusion criteria for the studies involved hip strength and PFPS investigation and excluded studies with multiple interventions. Four studies were selected for appraisal because they were all RCTs (Level 1b evidence) and all studies evaluated hip strength exercises for the hip abductors and lateral rotators as an intervention for PFPS. Data Extraction: Two of the studies included were conducted on females while the remaining two were performed on both males and females with PFPS. Interventions included weekly sessions (4-6 weeks) involving hip muscle training versus quadriceps strengthening. Outcome measures included pain assessment, muscular strength and lower extremity function. Studies were appraised for validity utilizing the Physiotherapy Evidence Database (PEDro), in which two studies scored a 7/10 and two scored a 9/10. Data Synthesis: Level 1b evidence exists showing the effectiveness of hip strengthening exercises for treatment of PFPS. All interventions utilizing hip strengthening exercises demonstrated significantly greater and/or more consistent reduction of pain and an increase in strength when compared to other types of strengthening exercises in individuals with PFPS. Conclusion: A reasonable amount of evidence exists to support the implementation of rehabilitation programs that include hip strengthening exercises to help improve function and reduce pain in individuals with PFPS. These muscle groups are well established in the literature as essential to eccentric hip control. Eccentric hip control help sprevent excessive femoral abduction and internal rotation, which can lead to lateral patellar tracking, a risk factor of PFPS. Therefore, it is suggested that clinicians implement a hip strengthening program that includes hip abduction and external rotation for patients diagnosed with PFPS. Future research should aim to provide additional insight into the development of these programs for physically active populations such as comparing the efficacy of weight- bearing exercises to isolated hip exercises.

CLINICAL SCENARIO

Patellofemoral pain syndrome (PFPS) is one of the most common knee pathologies affecting the physically active population. It is estimated to occur in nearly 40% of the population contributing to a higher incidence in females. Patients may complain of peripatellar and/or retropatellar pain aggravated by activities involving squatting, ascending and descending stairs, prolonged sitting and running. Although a true etiology continues to remain unknown, several factors have been thought to contribute to PFPS. A commonly accepted etiology is based on a result of abnormal patellar tracking due to muscle weakness and imbalance between the vastus medialis (VM) and vastus lateralis (VL) of the quadriceps muscle group. Other contributing factors may include repetitive stress and overuse, soft tissue tightness or adhesions, poor foot biomechanics and increased Q angle.

Traditional clinical interventions for PFPS have primarily addressed patellar alignment and motion with quadriceps strengthening primarily focused on the oblique fibers of the VM. Other treatment approaches have included patellar bracing, patellar taping, soft tissue mobilization and stretching. Recent studies have presented a connection between hip musculature eccentric contraction and PFPS. Studies have shown that hip muscle weakness may lead to increased hip adduction and hip internal rotation and may result in an increased lateral force acting more prominently on the patella therefore directly contributing to PFPS development. These studies have prompted the investigation of hip musculature training to improve symptoms and function in individuals with PFPS.

CLINICAL QUESTION

Can hip musculature strengthening help improve function and decrease pain for physically active individuals with patellofemoral pain syndrome?

SEARCH STRATEGY

A database search was conducted in SPORTDiscus, Physical Education Index (ProQuest), Academic Search Premier, CINAHL and PubMed. Key words included: Patient, active or physical; Intervention, hip strengthening or hip exercise; Outcome, decrease pain or decrease symptoms or increase muscle strength. The search was limited to research published in the past 10 years that used human subjects. The literature was searched for studies with Oxford Centre of Evidence-Based Medicine (CEBM) Level 1 evidence. Inclusion criteria for the studies involved hip strength and PFPS investigation and excluded studies with multiple interventions. Four studies were selected for appraisal because they were all RCTs (Level 1b evidence) and all studies evaluated hip strength exercises for the hip abductors and lateral rotators as an intervention for PFPS.

Table 1 PICO Search Strategy

	Keywords
Population (P)	active or physical
Intervention (I)	hip strengthening or hip exercise
Comparator (C)	N/A
Outcome (O)	decrease pain or decrease symptoms or increase hip muscle strength

RESULTS OF SEARCH

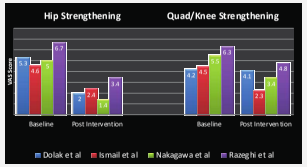
Hip Strengthening Exercise

All four studies looked at hip strengthening with exercises targeting mainly the lateral hip rotators and hip abductors as the intervention. Exercises prescribed varied to include single joint movements, closed kinetic chain exercises and resisted exercises. All four studies reported significantly reduced pain on the Visual Analog Scale (VAS) at the end of the intervention. (See Figure 1) when compared to their respective control groups. Dolak et al reported a significant improvement in function on the Lower Extremity Functional Scale (LEFS) (56.5±12.2 to 67.6±11.5; P=0.006) and a significant increase in hip strength (5.2 ± 1.5 to 6.6 ± 0.9; P=0.001) demonstrating a 21% increase. Nakagawa et al reported a significant increase in EMG activity of the gluteus medius (51.7±29.5 to 127.8±145.6; P=0.03) and a significant increase in eccentric knee extensor peak torque (264.9±84.8 to 318.9±96.8; P=0.04).

Quadriceps/Knee Strengthening Exercises

All four studies utilized quadriceps and/or knee strengthening exercises as a comparison. Exercises utilized included quad strengthening via closed kinetic chain exercises and resisted exercises. Nakagawa et al included stretching and patellar mobilization. Only two studies demonstrated a significant decrease in pain (See Figure 1). Dolak et al reported no significant decrease in pain (See Figure 1). Nakagawa et al reported no significant decrease in pain (see Figure 1), but did report a significant increase in eccentric peak torque (283.6±45.0 to 301.9±63.4; P=0.02).

Figure 1



CHARACTERISTICS OF STUDIES

	Ismail et al (2013)	Dolak et al (2011)	Razeghi et al (2010)	Nakagawa (2008)
Study Design	RCT	RCT	RCT	RCT
Participants	32 males and females	33 females	33 females	14 males and females
Intervention	6 weeks Closed Kinetic Chain Knee Exercise group- mini wall squat, forward/lateral step – up, terminal knee extension Closed Kinetic Chain Knee Exercise with Hip exercises- same as above; resistive hip abduction and external rotation	4 weeks Quad group- quad sets; short-arc quads; SLR; terminal knee extension Hip group- hip abduction and external rotation side lying and standing; seated external rotation; lateral step downs, single leg balance; lunges	4 weeks Knee group- terminal and 90° to 50° knee extension and mini squats Hip/Knee group- terminal and 90° to 50° knee extension and mini squats; progressive resistive exercises for hip musculature	6 weeks Control group- quad sets; SLR, mini squats; wall slides, step-ups, forward lunges Intervention group- hip abductors and lateral rotators isometrics invarious positions, forward lunge with elastic resistance
Outcome Measures	Primary: Pain- visual analog scale (VAS) and Kujala questionnaire for PFPS Secondary: Dynamic muscle strength	Primary: Pain- VAS; Function- lower extremity functional scale (LEFS) Secondary: Isometric strength	Primary: Pain- VAS Secondary: Isometric strength	Primary: Pain- VAS Secondary: Eccentric peak torque; Gluteus Medius EMG activity
Main Findings	CKC- significant pain decrease (4.5±1.8 to 2.3±1.1; p<0.06) CKCH- significant pain decrease (5.3±1.6 to 2.0±1.1: p<0.05) Significantly less pain in CKCH group than CKC group (p<0.03) No significant difference in dynamic muscle strength (p=0.25; p=0.28; p=0.43; p=0.17)	Quad group- no significant pain decrease (4.2±2.3 to 4.1±2.5; p=0.88) Hip group- significant pain decrease (4.6±2.5 to 2.4±2.5; p=0.001) Significantly less pain in hip group than quad group (p=0.035) LEFS- overtime improvement from baseline (56.5 ± 12.2) to 4 weeks (63 ± 12.7) (p=0.006) Hip group- significant increase in strength (5.7 ± 2.2) to 8 weeks (6.2 ± 1.8; p=0.09)	Knee group- significant pain decrease (6.3±1.3 to 4.8±1.8; p=0.005) Hip/Knee group- significant pain decrease (6.7±1.6 to 3.6±1.5; p<0.001) Significantly less pain in hip/knee group than knee group (p=0.032) Significant increase in isometric strength of hip flexion (p=0.004), hip abduction (p=0.003) and hip external rotation (p=0.004)	Control group- no significant decrease in pain (5.5±1.5 to 3.4±1.9; p=0.20) Intervention group- significant decrease in pain (5.0±2.1 to 1.4±1.3; p=0.03) Significant increase in gluteus medius EMG activity (51.7±29.5 to 127.8±145.6; p=0.03) Significant increase in peak knee extensor torque (264.9±84.8 to 318.9±96.8; p=0.04)
Conclusion	Six weeks of a CKC hip and knee strengthening program with isolated hip strengthening has an increased effect on pain relief in individuals with PFPS	Initial hip strengthening in individuals with PFPS may help with pain relief as opposed to quad strengthening exercises	Improvement with hip abduction and hip external rotation can reduce symptoms associated with PFPS	Supplementing hip abductor and lateral rotator strengthening to quad exercise program provides benefits for greater pain relief and increased function in individuals with PFPS

DISCUSSION

All four studies demonstrated a significantly greater or more consistent reduction of pain or an increase in strength when compared to other types of strengthening exercises to address PFPS. The findings in all four studies indicate the use of a hip strengthening program in the treatment of PFPS (pain and function) for the physically active population. Although different programs were developed with variations in exercises, repetitions, sets, or program duration, every study focused on the strengthening of the hip abductors and external rotators. Countless studies have verified the role of hip abductors and external rotators in eccentric hip control. Eccentric hip control helps prevent excessive femoral abduction and internal rotation; which can lead to lateral patellar tracking thus possible development of PFPS.

It is suggested that clinicians considered implementing any hip strengthening program that focuses on hip abductors and external rotators for patients diagnosed with PFPS in addition to quadriceps strengthening. Programs should begin with basic and regressed exercises and gradually progress to functional exercises incorporating the most use of the hip musculature. Clinicians may also consider the use of the hip strengthening programs as a preventative measure towards PFPS.

In the subject of hip strengthening and PFPS, future research should focus on comparing weight- bearing exercises to isolated hip exercises. Comparing the two types of exercises may provide insight on developing exercises programs for specific physically active populations. Additional studies should include the investigation of other pelvic or hip muscles that may influence the treatment of PFPS. In regards to research design, future research should contain a greater sample size and conduct follow up periods in order to assess long term effects of hip musculature strengthening exercises. The blinding of subjects and therapists should also be implemented in order to increase validity.

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Appendix 10

Core Concepts: Understanding the Complexity of the Spinal Stabilizing Systems in Local and Global Injury Prevention and Treatment

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Core Concepts: Understanding the Complexity of the Spinal Stabilizing Systems in Local and Global Injury Prevention and Treatment

Lindsay Warren, MS, ATC, CSCS, lwarren@calbpatist.edu; Russell Baker, DAT, russellb@uidaho.edu; Alan Nasypany, EdD, LAT, ATC, alann@uidaho.edu; Jeffrey Seegmiller, EdD, ATC, jeffreys@uidaho.edu, *University of Idaho*

Correspondence should be directed to:
Lindsay Warren
8432 Magnolia Avenue, Riverside, CA, 92604
951-552-8820 (p)
951-343-4343 (f)
lwarren@calbaptist.edu

Key Points:

1) Stabilization of the spine is a dynamic and complex task.
2) Poor dynamic core stabilization results in increased risk of injury to the spine and extremities.
3) A patient will be unable to complete ideal movement patterns without proper muscular control, coordination, timing, strength, and endurance.

Abstract:

The core is central to almost all extremity movement, especially in athletics. Running, jumping, kicking and throwing, are dependent on core function to create a stable base for movement. Poor core strength, endurance, stiffness, control, coordination or a combination thereof can lead to decreased performance and increased risk of injury. Due to the core's many complex elements, none of which are more or less important than the next, it is imperative that athletic trainers have a systematic and comprehensive plan for assessing and treating patients with stability or motor control dysfunctions of the entire spinal stabilizing system. The purpose of this clinical commentary is to outline the structural (anatomical) components of the core and their functions, establish the elements of core stability (functional), review their importance in decreasing the risk of injury, and discuss the application of this information in athletic training.

Despite the common use of the term "core" in rehabilitation, its definition, structure, purpose, and role in rehabilitation is still disputed among healthcare professions. The discussion of its importance to clinical practice continues as more is learned, through analysis of regional interdependence, about the role the core plays in injury management and prevention. To move forward, understanding is needed on the foundational purpose of the core in movement. Many agree that the core's primary function is to act as a singular unit, provide a stable foundation for movement, with or without the extremity, and provide local and global balance and strength. During movement, this task is accomplished with the use of passive and active core structures.[1]

While researchers in this area agree on the function of the core, debate continues as to what anatomical structures truly encompass the core. Many researchers propose the core is an integrated system, comprised of the passive spinal column of bony and ligamentous structures, the active spinal muscles and thoracolumbar fascia, and the neural control unit.[1-5] Kibler, Press, and Sciascia[2] postulate the core contains the musculoskeletal structures of the spine, hips, pelvis, abdomen, and the proximal lower limb. Akuthota and Nadler,[1] in contrast, define the core as a box, with the diaphragm as the roof, the pelvic floor and hip girdle as the floor, and the abdominals, spinal, and gluteal muscles serving as the walls.

Attempting to use a more holistic approach, Pavel Kolar[6] coined the term Integrated Spinal Stabilizing System (ISSS). The ISSS is comprised of the deep cervical flexors, deep spinal extensors of the cervical and thoracic regions, diaphragm, pelvic floor, and all sections of the abdominals and spinal extensors of the lower thoracic and lumbar regions.[6] Kolar's inclusion of the cervical spine is unique, as traditional models of the core focused on the lumbar and pelvic regions. The inclusion of the cervical spine, however, is important as the cervical spine plays an integral role in global stabilization. An example to illustrate this point is provided is demonstrated through the relationship between the progressive nature of the developmental kinesiology of infants and their developing central nervous system (CNS).[6,7] Newborns, for instance, are only able to stabilize their head in a sitting position for a few seconds.[7] While a more developed infant, with a more developed ISSS, is able perform more elaborate

movements (e.g., reaching while sitting upright) while simultaneously maintaining the stability of the entire spinal column. To control extremity movement, the ISSS must brace in order for movement to be achieved against gravity, while providing protection for the cervical spine. Under ideal conditions, synergy of neck flexors and spinal extensors is in balance, allowing for controlled movements, and stabilization of the cervical and thoracic spine.[6,7]

Core Stability- Theory in Practice

With the purpose and components of the core identified, a clinician can begin to evaluate and apply the concept of "core stability." Core stability is another commonly used term with variation in its application. Most agree that proper functioning of the core is necessary to create stability and that dysfunction creates instability,[1-4] but identifying the key elements is necessary for implementation in practice. Much of the recent focus in the literature regarding core stability has focused on the following elements: muscular capacity, motor control, and coordination and stiffness.[3-4]

Muscular capacity is a muscle's ability to generate and/or maintain force.[8] Endurance and strength are components of muscular capacity, which are necessary for the spinal stabilizing musculature to achieve movement and sustain postures. The anatomical orientation of a muscle's origin and insertion determines its performance during certain tasks, whether strength or endurance oriented. The trunk muscles may be classified by their function into local or global muscles. The local muscles (e.g., intertransversarii, rotatores, multifidus) have direct attachments to the vertebrae, and are limited in their ability to generate torque. The primary contribution of local muscles is precise control of the individual spinal vertebrae. Due to their small moment arm and Type I fibers, the local muscles are well equipped to sustain postures and are resistant to fatigue.[9]

Conversely, global muscles (e.g., rectus abdominis, longissimus thoracis, external obliques) cross several spinal joints and attach to the hip and the thorax. As the global muscles have a larger moment arm with which to create torque, the ability to resist greater external forces is provided through these structures. Without sound muscular capacity in local and global muscle groups, the risk of injury and incidence of

pain increases. Poor endurance of the trunk muscles is a predictor of occurrence of low back pain in men[10] and is commonly found in patients suffering from chronic low back pain.[11,12] Lehman,[13] Faries and Greenwood,[9] and McGill[14] believe endurance to be more important than strength in the spinal stabilizing musculature.

To improve muscular capacity of the core, many clinicians chose to design comprehensive strengthening programs. A common solution to muscular capacity issues in the core is comprehensive strengthening programs, which have been advocated for the prevention of various musculoskeletal disorders,[15] as well as performance enhancement.[3] However, there are problems with traditional core strengthening programming.

Firstly, assessing for and diagnosing muscle weakness is not as simple as strength or endurance testing. Individuals without proper CNS integration, for example, may be unable to adjust muscle strength to the demands of a movement or recruit accessory muscles for stabilization, making movement patterns inefficient and weak. A strengthening program then does not target what may be the primary etiology. Consequently, balance or strengthening exercises prescribed to a patient with poor stabilization or motor control may promote pathological movement patterns, increase the patient's pain, and ultimately be unsuccessful.[1,6-7]

Secondly, the activation of specific trunk muscles is dependent on several factors. Completing an exercise or maintaining a position on a stable or unstable surface results in differing muscle activation patterns and contraction intensities, as studied by intra-muscular EMG.[17] The body segment initiating motion during an exercise (e.g., trunk or pelvis) also changes the activation of trunk musculature.[18] The overload principle of strengthening is not advocated for the core musculature due to lumbar spine involvement. For example, the traditional sit-up increases compressive load on the lumbar spine and is considered an unsafe exercise.[16] Pelvic tilts also create increased spinal loading, as do back extensor strengthening machines. As a result, traditional strengthening often creates an unsafe load of the spine and may cause injury.[1,16] Several researchers, including Saal and Saal,[19] McGill,[20] and Sahrmann,[21] have recommended safer programs that are focused on sparing the spine in progressive stabilization exercises to address these problems.[1] Unfortunately, some

programs emphasize a rigid, rod-like spine during activity,[20] instead of promoting functional dynamic movement patterns.

Researchers studying muscle weakness patterns associated with injury have discovered weakness in the load transferring muscles (i.e., hip abductors and hip external rotators), not the local stabilizing or global mobilizing core musculature, as the primary predictor of injury[8] and low back pain.[22] Most studies report muscular recruitment changes of the core muscles, such as timing and control, both prior to and resulting from injury.[8,15,23-25,27-28,30-31] The implication of such findings suggests neuromuscular control (i.e., motor control) is of more importance that strength .[3-4,8,15, 23-32,34,40,42,45]

Motor control, an unconscious action, is the process of the CNS's generation and monitoring of movement commands, through feed-forward (e.g., anticipation) and sensory feedback mechanisms (e.g., proprioception, vision).[32] The brain plays an important role in spinal stability in anticipatory and reactive capacities. During this process, the brain subconsciously adjusts and adapts to internal and external forces, as well as anticipates movements of the extremities and the trunk. In fact, motor control performance is more efficient when subjects are not focusing on the movement being measured and instead have an external focus.[33] Training to improve motor control is accomplished by using the motor learning approach to retrain the *unconscious* use of a more functional pattern over the dysfunctional pattern. For the core, this involves pre-activation of the deep trunk muscles and integration of the global trunk muscles in a progression from static to dynamic to functional tasks.[34,35] Any extremity movement is preceded by an anticipatory contraction of the core musculature to create the stable base for that movement.[36] Therefore, in order for a movement progression to be successful, this pre-activation must be attained. Co-contraction exercises, balance training, proprioceptive training, plyometrics, and sport specific skills have been identified as essential components in re-establishing and strengthening motor control.[37]

Dynamic core function is of paramount importance in injury prevention and rehabilitation. Sensory-motor control deficiency and neuromuscular imbalances of the core have been linked to the occurrence of low back and lower extremity injuries,

especially in females.[25,30,31] Inadequate motor control and poor muscular recruitment are among the causes of non-specific low back pain. The reduced stability of the segments of the spine creates altered and dysfunctional distribution of loads.[38,39] Additionally, neuromuscular imbalances result in poor control and decreased stability, which in turn cause compensatory movement patterns and poor motor recruitment down the chain, in an attempt to maintain function.[16] Motor re-learning of inhibited core muscles in patients with low back pain[28] and restoration of core motor control in patients at risk of anterior cruciate ligament injury[37] is more important than strengthening and endurance training of the core musculature.

The importance of proper motor control in preventing and treating extremity injuries is often associated with the term regional interdependence. Zuzulak et al.[30] demonstrated that proprioceptive deficits in the core contributed to decreased neuromuscular control of the lower extremity. Decreased motor control of the lower extremity led to increased valgus moment and strain to the ligaments of the knee.[25] Poor proximal neuromuscular control is one etiological factor in patellofemoral pain syndrome (PFPS). Earl and Hoch[40] determined that improving neuromuscular control of the core decreased pain and increased functional ability in female patients with PFPS. Nadler and colleagues also demonstrated that patients complaining of lower extremity overuse injuries were significantly more likely to seek treatment for low back pain within the following year.[28,29] In a systematic review, Macedo, Maher, Latimer, and McAuley[39] reported the outcomes of motor control exercise compared with other interventions for the treatment of patients with non-specific low back pain. The researchers indicated that motor control exercise was favored over minimal intervention and produced clinical outcomes that equaled the success of surgical L4-L5 fusion.[39]

Appropriate motor control allows for the last element, a combination of coordination and stiffness, to produce core stability. Through coordinated contraction of the spinal stabilizing system, stiffness is produced in the core and that determines joint stability. Stiffness of the spinal column is increased with the coordinated co-activation of the core musculature, which protects the structures of the spine during any activity.[41] Even under heavily loaded conditions, such as a heavy dead lift, spinal

ligaments are not strained and stability is the responsibility of the musculature.[3] For example, the coordinated and balanced co-activation of the internal obliques, transverse abdominis, and external obliques, tensions the thoraco-lumbar fascia and creates stiffness like a stabilizing corset. Coupled with the regulation of intra-abdominal pressure (IAP) and control of the pelvic floor, spinal stability is created that precedes any conscious movement and is under autonomic control.[23,30] Immense, albeit unconscious, coordination of muscle activation is needed to successfully create uniform stiffness necessary to stabilize the spine in all three cardinal planes. If contractions were not coordinated, an imbalance in force or direction would arise resulting in movement dysfunction and compromised spinal stability.

Clinical Assessment Implications

The correlation between inappropriate core stabilization and injury, at the core and in the extremities, provides evidence for treating the core as the center of the foundational kinetic chain. The utility of the core is dependent on the coordinated action of the ISSS structures. The dynamic relationship of these structures makes the assessment and treatment of patients with core stability or motor control dysfunctions difficult to address. As a result, some have shifted clinical evaluation to focus on movement screens and the regional interdependence paradigm.[6,7,42] The goal of any movement pattern analysis is not to isolate structures, but to achieve a global understanding of a system and how structures interact with one another on a functional level to achieve a movement.[42]

Using the knee as an example, a clinician could attempt to isolate the different structures needed to perform a movement (e.g., seated knee extension), to determine potential involvement in a patient presenting with knee pain. In its simplest form, the knee would need functioning local bone (e.g., medial and lateral femoral condyles, tibial epicondyles), articular (e.g., capsule, ligaments) and muscular components (e.g. quadriceps muscle and tendon) to perform the movement, given proper neuromuscular control and balance with the antagonistic hamstrings. The local exam, however, would ignore the feed forward anticipation of the weight of the leg and the force needed to create the movement against gravity; the feed-back sensory

information of the proprioception of the leg in space, communicating with the central nervous system to control the speed and direction of the movement, would also be missed. If any element of the system were damaged or inhibited, a dysfunctional movement would be created. The dysfunctional movement pattern would, in turn, begin affecting the other surrounding structures at the knee and along the kinetic chain. In short, dysfunction at the core could produce dysfunction, pain, and impairment at the knee. A physical exam evaluating the knee in isolation would create a local patho-anatomic diagnosis that would not address that cause of the pathology and would produce an insufficient rehabilitation program.[6,42]

The belief that the body does not function in isolation and dysfunction in one part of the body has direct implications for other parts of the body, is the premise of regional interdependence.[42] Motion at one segment will influence that of all other segments in the chain.[19] Thus, it is fitting that the dynamic system that comprises spinal stability would be best assessed using a movement assessment, to help create a complete picture of a patient's core motor control function.[43-45]

Conclusion

Based on the literature evidence, a logical conclusion is core performance is a comprehensive task comprised of multiple elements, of potentially equal importance, that have significant implications in the prevention and management of injury. Performance of the core is not simply determined by its strength or endurance, but also the coordination, timing, and control of multiple structures. As more is learned about the core stabilizing system, less emphasis is being placed on the passive structures in rehabilitation and more focus is being placed on the motor control and muscular capacity of the lumbo-pelvic complex[8,46,47]. With its complex nature, and significant implications in the management of injuries, it is important for athletic trainers to have a comprehensive understanding of core motor control and stability. It is critical to understand the function of each structure, the coordination of each structure to those related to it, and the role the brain plays in controlling those structures to provide effective prevention and rehabilitation programs to our patients. Implementation of assessment and rehabilitation strategies that incorporate motor

control and stability dysfunctions of the spine has the potential to positively improve patient care across a variety of clinical setting and patient presentations.

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Appendix 11

Lasater Clinical Judgment Rubric

LASATER CLINICAL JUDGMENT RUBRIC
Noticing and Interpreting

Effective NOTICING involves:	Exemplary	Accomplished	Developing	Beginning
Focused Observation	Focuses observation appropriately; regularly observes and monitors a wide variety of objective and subjective data to uncover any useful information	Regularly observes/monitors a variety of data, including both subjective and objective; most useful information is noticed, may miss the most subtle signs	Attempts to monitor a variety of subjective and objective data, but is overwhelmed by the array of data; focuses on the most obvious data, missing some important information	Confused by the clinical situation and the amount/type of data; observation is not organized and important data is missed, and/or assessment errors are made
Recognizing Deviations from Expected Patterns	Recognizes subtle patterns and deviations from expected patterns in data and uses these to guide the assessment	Recognizes most obvious patterns and deviations in data and uses these to continually assess	Identifies obvious patterns and deviations, missing some important information; unsure how to continue the assessment	Focuses on one thing at a time and misses most patterns/deviations from expectations; misses opportunities to refine the assessment
Information Seeking	Assertively seeks information to plan intervention: carefully collects useful subjective data from observing the client and from interacting with the client and family	Actively seeks subjective information about the client's situation from the client and family to support planning interventions; occasionally does not pursue important leads	Makes limited efforts to seek additional information from the client/family; often seems not to know what information to seek and/or pursues unrelated information	Is ineffective in seeking information; relies mostly on objective data; has difficulty interacting with the client and family and fails to collect important subjective data
Effective INTERPRETING involves:	**Exemplary**	**Accomplished**	**Developing**	**Beginning**
Prioritizing Data	Focuses on the most relevant and important data useful for explaining the client's condition	Generally focuses on the most important data and seeks further relevant information, but also may try to attend to less pertinent data	Makes an effort to prioritize data and focus on the most important, but also attends to less relevant/useful data	Has difficulty focusing and appears not to know which data are most important to the diagnosis; attempts to attend to all available data
Making Sense of Data	Even when facing complex, conflicting or confusing data, is able to (1) note and make sense of patterns in the client's data, (2) compare these with known patterns (from the nursing knowledge base, research, personal experience, and intuition), and (3) develop plans for interventions that can be justified in terms of their likelihood of success	In most situations, interprets the client's data patterns and compares with known patterns to develop an intervention plan and accompanying rationale; the exceptions are rare or complicated cases where it is appropriate to seek the guidance of a specialist or more experienced nurse	In simple or common/familiar situations, is able to compare the client's data patterns with those known and to develop/explain intervention plans; has difficulty, however, with even moderately difficult data/situations that are within the expectations for students, inappropriately requires advice or assistance	Even in simple of familiar/common situations has difficulty interpreting or making sense of data; has trouble distinguishing among competing explanations and appropriate interventions, requiring assistance both in diagnosing the problem and in developing an intervention

LASATER CLINICAL JUDGMENT RUBRIC
Responding and Reflecting

Effective RESPONDING involves:	Exemplary	Accomplished	Developing	Beginning
Calm, Confident Manner	Assumes responsibility: delegates team assignments, assess the client and reassures them and their families	Generally displays leadership and confidence, and is able to control/calm most situations; may show stress in particularly difficult or complex situations	Is tentative in the leader's role; reassures clients/families in routine and relatively simple situations, but becomes stressed and disorganized easily	Except in simple and routine situations, is stressed and disorganized, lacks control, making clients and families anxious/less able to cooperate
Clear Communication	Communicates effectively; explains interventions; calms/reassures clients and families; directs and involves team members, explaining and giving directions; checks for understanding	Generally communicates well; explains carefully to clients, gives clear directions to team; could be more effective in establishing rapport	Shows some communication ability (e.g., giving directions); communication with clients/families/team members is only partly successful; displays caring but not competence	Has difficulty communicating; explanations are confusing, directions are unclear or contradictory, and clients/families are made confused/anxious, not reassured
Well-Planned Intervention/Flexibility	Interventions are tailored for the individual client; monitors client progress closely and is able to adjust treatment as indicated by the client response	Develops interventions based on relevant patient data; monitors progress regularly but does not expect to have to change treatments	Develops interventions based on the most obvious data; monitors progress, but is unable to make adjustments based on the patient response	Focuses on developing a single intervention addressing a likely solution, but it may be vague, confusing, and/or incomplete; some monitoring may occur
Being Skillful	Shows mastery of necessary nursing skills	Displays proficiency in the use of most nursing skills; could improve speed or accuracy	Is hesitant or ineffective in utilizing nursing skills	Is unable to select and/or perform the nursing skills
Effective REFLECTING involves:	**Exemplary**	**Accomplished**	**Developing**	**Beginning**
Evaluation/Self-Analysis	Independently evaluates/ analyzes personal clinical performance, noting decision points, elaborating alternatives and accurately evaluating choices against alternatives	Evaluates/analyzes personal clinical performance with minimal prompting, primarily major events/decisions; key decision points are identified and alternatives are considered	Even when prompted, briefly verbalizes the most obvious evaluations; has difficulty imagining alternative choices; is self-protective in evaluating personal choices	Even prompted evaluations are brief, cursory, and not used to improve performance; justifies personal decisions/choices without evaluating them
Commitment to Improvement	Demonstrates commitment to ongoing improvement: reflects on and critically evaluates nursing experiences; accurately identifies strengths/weaknesses and develops specific plans to eliminate weaknesses	Demonstrates a desire to improve nursing performance: reflects on and evaluates experiences; identifies strengths/weaknesses; could be more systematic in evaluating weaknesses	Demonstrates awareness of the need for ongoing improvement and makes some effort to learn from experience and improve performance but tends to state the obvious, and needs external evaluation	Appears uninterested in improving performance or unable to do so; rarely reflects; is uncritical of him/herself, or overly critical (given level of development); is unable to see flaws or need for improvement

Clinical Reasoning

The purpose of this survey is to gain insight into your participation in the DAT as it pertains to changes in your clinical reasoning skill, perceptions, and self efficacy.

Your input is greatly appreciated. There is so much to learn about the student experience in such a new and unique degree. The information you provide here will be used to improve the program for future DAT students. So please take your time and answer honestly. Your answers will be confidential and will not effect your academic standing in any way.

Thanks again!

1. What is your age?

2. What is your sex:

3. What is the highest level of education you have completed?

- ◯ Bachelors
- ◯ Entry Level Masters
- ◯ Post Professional Masters
- ◯ Doctorate/PhD

4. What was your bachelors degree area of study?

- ☐ Athletic Training
- ☐ Kinesiology
- ☐ Communication
- ☐ Exercise Science
- ☐ Nutrition

Other (please specify)

5. If you completed a masters degree, what was the area of your study?

- ◯ Athletic Training
- ◯ Education
- ◯ Exercise Physiology
- ◯ Nutrition
- ◯ Kinesiology

Other (please specify)

6. If you completed a Doctorate or PhD, what was your area of study?

7. How many years have you been practicing as a certified athletic trainer? (please round up to the nearest year)

Clinical Reasoning

8. In how many different settings have you worked as a Certified Athletic Trainer?

9. How many years have you spent in each setting? (If in a dual role, please select both positions listing the secondary position in the "Dual Role" drop down)

	#Years Spent	Type	Dual Role?	Setting
Setting 1				
Setting 2				
Setting 3				
Setting 4				
Setting 5				
Setting 6				
Setting 7				
Setting 8				
Setting 9				
Setting 10				

Other (please specify # of years, type, dual role, and setting)

10. What is the job title of your current position?

11. About how long have you been in your current position?

Years

Months

12. On average, how many hours per week do you spend at work?

13. On average, how many hours per week do you spend acting as an educator (in a classroom setting)?

14. On average, about how many hours per week do you spend providing practice or event coverage?

15. On average, how many hours per week do you spend acting as a clinician providing direct patient care?

Clinical Reasoning

16. During a typical day, how many patients do you treat?

- ◯ 0-10
- ◯ 11-20
- ◯ 21-30
- ◯ 31-40
- ◯ 41-50
- ◯ 51 or more

Other (please specify)

17. During a typical week, how many patients do you treat?

- ◯ 0-20
- ◯ 21-40
- ◯ 41-60
- ◯ 61-80
- ◯ 81-100
- ◯ 101 or more

18. About how much time on average do you spend completing a patient evaluation? (in minutes)

19. About how much time on average do you spend performing a patient intervention? (in minutes)

20. On average, what percentage of your time is spent on patient oriented documentation? (e.g. SOAPs, EMR inputting, insurance, etc.)

21. On average, what percentage of your time is spent performing administrative duties? (e.g. staff meetings, practice coverage, non-patient care, etc.)

22. How often do you attend national, regional, or state meetings/symposia?

- ◯ One per year
- ◯ Two per year
- ◯ More than two per year

Clinical Reasoning

23. What seminars, courses, or other continuing education opportunities (offering a certificate of completion) have you taken outside of what has been offered at a national, regional, or state meetings/symposia? Please select all that apply.

- [ ] None
- [ ] Mulligan Concept, Upper Quadrant
- [ ] Mulligan Concept, Lower Quadrant
- [ ] Mulligan Concept, Advanced
- [ ] McKenzie Institute MDT Part A
- [ ] McKenzie Institute MDT Part B
- [ ] McKenzie Institute MDT Part C
- [ ] McKenzie Institute MDT Part D
- [ ] Dynamic Neuromuscular Stabilization, Part A
- [ ] Dynamic Neuromuscular Stabilization, Part B
- [ ] Dynamic Neuromuscular Stabilization, Part C
- [ ] Dynamic Neuromuscular Stabilization, Advanced
- [ ] Total Motion Release
- [ ] Myofascial Decompression (cupping)
- [ ] Myofascial Release
- [ ] Active Realease Technique
- [ ] Instrument Assisted Soft Tissue Mobilization (Grastin, Gavilan, Guasha, etc.)
- [ ] Primal Reflex Release Technique
- [ ] Functional Movement Screen
- [ ] Selective Functional Movement Assessment
- [ ] Strain Counter-strain (Jones), I-Spine
- [ ] Strain Counter-strain (Jones), II-Extremities
- [ ] Strain Counter-strain (Jones), Upper Quarter
- [ ] Strain Counter-strain (Jones), Pelvic Pain
- [ ] Positional Release Technique (PRT-i), Spine and Pelvis
- [ ] Positional Release Technique (PRT-i),pUper Extremity
- [ ] Positional Release Technique (PRT-i),dLwer Extremity
- [ ] Positional Release Technique (PRT-i), Advanced Techniques

Other (please specify any other courses)

Clinical Reasoning

24. Self Efficacy is defined as the belief that one is capable of accomplishing a behavior or developing a competency.

How would you rate your self efficacy in the following areas?

	Very Low	Low	Moderate	High	Very High
Prevention	◯	◯	◯	◯	◯
Clinical Evaluation and Diagnosis	◯	◯	◯	◯	◯
Immediate Care	◯	◯	◯	◯	◯
Treatment, Rehabilitation, and Reconditioning	◯	◯	◯	◯	◯
Organization and Administration	◯	◯	◯	◯	◯
Professional Responsibility	◯	◯	◯	◯	◯
Research Implications in Clinical Practice	◯	◯	◯	◯	◯
Patient Outcomes	◯	◯	◯	◯	◯
Statistics	◯	◯	◯	◯	◯
Basic Science	◯	◯	◯	◯	◯
Scholarship	◯	◯	◯	◯	◯
Mentorship	◯	◯	◯	◯	◯

Clinical Reasoning

25. Self Efficacy is defined as the belief that one is capable of accomplishing a behavior or developing a competency.

How would you rate your self efficacy in the following areas as compared to the entry level athletic trainer?

	Very Low	Low	Moderate	High	Very High
Prevention	◯	◯	◯	◯	◯
Clinical Evaluation and Diagnosis	◯	◯	◯	◯	◯
Immediate Care	◯	◯	◯	◯	◯
Treatment, Rehabilitation, and Reconditioning	◯	◯	◯	◯	◯
Organization and Administration	◯	◯	◯	◯	◯
Professional Responsibility	◯	◯	◯	◯	◯
Research Implications in Clinical Practice	◯	◯	◯	◯	◯
Patient Outcomes	◯	◯	◯	◯	◯
Statistics	◯	◯	◯	◯	◯
Basic Science	◯	◯	◯	◯	◯
Scholarship	◯	◯	◯	◯	◯
Mentorship	◯	◯	◯	◯	◯

Clinical Reasoning

26. Self Efficacy is defined as the belief that one is capable of accomplishing a behavior or developing a competency.

How would you rate your self efficacy in the following areas as compared to an athletic trainer with your same number of years experience?

	Very Low	Low	Moderate	High	Very High
Prevention	◯	◯	◯	◯	◯
Clinical Evaluation and Diagnosis	◯	◯	◯	◯	◯
Immediate Care	◯	◯	◯	◯	◯
Treatment, Rehabilitation, and Reconditioning	◯	◯	◯	◯	◯
Organization and Administration	◯	◯	◯	◯	◯
Professional Responsibility	◯	◯	◯	◯	◯
Research Implications in Clinical Practice	◯	◯	◯	◯	◯
Patient Outcomes	◯	◯	◯	◯	◯
Statistics	◯	◯	◯	◯	◯
Basic Science	◯	◯	◯	◯	◯
Scholarship	◯	◯	◯	◯	◯
Mentorship	◯	◯	◯	◯	◯

Clinical Reasoning

27. Self Efficacy is defined as the belief that one is capable of accomplishing a behavior or developing a competency.

How would you rate your self efficacy in the following areas as compared to an expert?

	Very Low	Low	Moderate	High	Very High
Prevention	◯	◯	◯	◯	◯
Clinical Evaluation and Diagnosis	◯	◯	◯	◯	◯
Immediate Care	◯	◯	◯	◯	◯
Treatment, Rehabilitation, and Reconditioning	◯	◯	◯	◯	◯
Organization and Administration	◯	◯	◯	◯	◯
Professional Responsibility	◯	◯	◯	◯	◯
Research Implications in Clinical Practice	◯	◯	◯	◯	◯
Patient Outcomes	◯	◯	◯	◯	◯
Statistics	◯	◯	◯	◯	◯
Basic Science	◯	◯	◯	◯	◯
Scholarship	◯	◯	◯	◯	◯
Mentorship	◯	◯	◯	◯	◯

28. What do you project to be your top 5 challenges in the next year of coursework? (order from most challenging to least challenging)

1.
2.
3.
4.
5.

29. What aspects of the program have you had the most difficulty with thus far?

Clinical Reasoning

30. On average, how much time per week do you spend reflecting on your clinical practice?

- ◯ I have not had time
- ◯ less than 1 hour
- ◯ 1-2 hours
- ◯ 3-4 hours
- ◯ 5 or more hours

31. How satisfied are you regarding mentorship you have received during your career?

	Very dissatisfied	Dissatisfied	Satisfied	Very Satisfied
Professionally (prior to becoming a Certified Athletic Trainer)	◯	◯	◯	◯
Post Professionally (after becoming a Certified Athletic Trainer)	◯	◯	◯	◯

32. In questions 30 and 31 you are asked about your feelings and thoughts during the last month. In each case, you will be asked to indicate how often you felt or thought a certain way.

	Never	Almost Never	Sometimes	Fairly Often	Very Often
In the last month, how often have you been upset because of something that happened unexpectedly?	◯	◯	◯	◯	◯
In the last month, how often have you felt that you were unable to control the important things in your life?	◯	◯	◯	◯	◯
In the last month, how often have you felt nervous and “stressed”?	◯	◯	◯	◯	◯
In the last month, how often have you felt confident about your ability to handle your personal problems?	◯	◯	◯	◯	◯
In the last month, how often have you felt that things were going your way?	◯	◯	◯	◯	◯

Clinical Reasoning

33. .

	Never	Almost Never	Sometimes	Fairly Often	Very Often
In the last month, how often have you found that you could not cope with all the things that you had to do?	◯	◯	◯	◯	◯
In the last month, how often have you been able to control irritations in your life?	◯	◯	◯	◯	◯
In the last month, how often have you felt that you were on top of things?	◯	◯	◯	◯	◯
In the last month, how often have you been angered because of things that were outside of your control?	◯	◯	◯	◯	◯
In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	◯	◯	◯	◯	◯

34. What do you feel guides your clinical decision making at this time?

Clinical Reasoning

35. When considering the clinical reasoning process...

	Fully Disagree	Disagree	Agree	Fully Agree
I feel generally familiar with the problem solving approach	◯	◯	◯	◯
I feel at ease with the different steps of the process	◯	◯	◯	◯
I have no problems defining the context of a patient's problem	◯	◯	◯	◯
I feel capable of summarizing the main features of a patient's problem	◯	◯	◯	◯
I feel competent generating working hypotheses	◯	◯	◯	◯
I have no problem in re-evaluating my hypotheses in the light of new findings	◯	◯	◯	◯
I feel capable of organizing my hypotheses hierarchically	◯	◯	◯	◯
I have no difficulties in applying newly acquired information to a problem	◯	◯	◯	◯
I feel at ease managing patient problems	◯	◯	◯	◯
I feel competent applying the clinical reasoning process in patient care	◯	◯	◯	◯

Clinical Reasoning

36. Please answer the questions as honestly as possible, in a way that shows your current state AT THIS TIME, not how you would like to be, or how you think you should be. The first answer that pops into your head is what is needed.

Using the scale provided, decide how much you either agree or disagree with each statement. Next to each statement, mark the answer that BEST indicates how you feel.

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
When I find an inconsistency between patient care and my knowledge, I take the time to get the answer.	◯	◯	◯	◯
Reflection has very little to do with critical thinking.	◯	◯	◯	◯
Even if I have complete assessment information, I find it difficult to choose an appropriate intervention.	◯	◯	◯	◯
I pride myself in thinking —outside the box in the clinical setting.	◯	◯	◯	◯
When something negative happens in the clinical area, I try to forget about it.	◯	◯	◯	◯

37. .

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
I am confident about the rationale for my choice of athletic training interventions when caring for patients	◯	◯	◯	◯
If I have adequate patient assessment information, I can choose an appropriate intervention.	◯	◯	◯	◯
When I know I'm right about a patient issue, I don't care what other team members think.	◯	◯	◯	◯
When I get new information, I carefully evaluate the reliability of the source.	◯	◯	◯	◯
I don't have trouble prioritizing the needs of my patients.	◯	◯	◯	◯

Clinical Reasoning

38. .

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
If an athletic trainer or clinician with more experience says I should do something, I do it, even if I'm not sure why.	◯	◯	◯	◯
I know the strengths and limitations of my clinical practice.	◯	◯	◯	◯
The only thing I focus on in the clinical area is the patient's physical condition.	◯	◯	◯	◯
I don't mind putting in extra effort to be sure I'm giving safe care.	◯	◯	◯	◯
I routinely look for new information that I can use in the clinical setting.	◯	◯	◯	◯

39. .

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
It's important to me to support my conclusions about patients with evidence.	◯	◯	◯	◯
I set goals to address my areas for improvement in the clinical setting.	◯	◯	◯	◯
When I learn something new, I share it with team members and peers.	◯	◯	◯	◯
I like to consider alternative solutions to difficult patient problems.	◯	◯	◯	◯
I am willing to change my viewpoint, if there is evidence to support a different one.	◯	◯	◯	◯

Clinical Reasoning

40. .

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
I frequently get a gut feeling about my patients.	◯	◯	◯	◯
I use both subjective and objective information to make judgments about patient care.	◯	◯	◯	◯
I would rather learn about the care of patients on my own than from other athletic trainers.	◯	◯	◯	◯
For each complex patient situation, there is a right and wrong way to deal with it.	◯	◯	◯	◯
When I make a mistake in the clinical area, I find it helpful to talk it over with someone who has more athletic training experience and that I trust.	◯	◯	◯	◯

41. .

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
When something goes wrong with my patient, my first intervention is to call the physician.	◯	◯	◯	◯
As long as I am working with other team members, I feel quite confident in my ability to care for my patients.	◯	◯	◯	◯
I can set priorities in the midst of a patient crisis.	◯	◯	◯	◯
My past life experiences help me to provide good patient care.	◯	◯	◯	◯
As a Certified Athletic Trainer I expect to function independently in patient care.	◯	◯	◯	◯

Thank you so much for your participation! Have a great day.