FICS ICSC Mopal / CMT Theory

Christine: Welcome to the ICSC manipulation principles with Dr. Tim Ray. The we will bring, Dr. Rick Ames in the second half and he is going to be talking about some motion palpation type stuff and soft tissue stuff as well. We will begin with Dr. Tim Ray and there is so many things for me to-to highlight for his professional career. I almost do not even know where to start.

Tim Ray: Thanks Christine. I appreciate the introduction. I am not going to spend a lot of time talking about myself. I, I would just wanted to say that I have been involved with FICS for a couple of decades and my chores in the International Federations Committee with the games commission, that deals with logistics and selections for International games for FICS. It is really a pleasure to speak with so many different people from so many different countries, and I find that very exciting. I would like to also acknowledge Dr. Brian Nook because he was the one that was really responsible for the majority of the content of this presentation. I have just added a little Tim Ray twist to it and we do this to ensure each presentation covers the same material no matter who is presenting it or where it is being presented.

My portion of this ICSC educational series deals with Basic Biomechanics and Kinesiology of Manipulative Therapy. I will cover some of the foundational principles of Osteo and Arthrokinematics in manual therapy because this will allow us to pr-provide us a baseline of understanding. We will follow in the hands-on section of the program. Understanding these principles allows us to model our clinical practices and prevents us from becoming technicians. We always want you to strive to be a clinician, not a technician. We wish to provide you a practical evidence-based, outcome-driven education, to be able to understand, defend, and appropriately apply this practice or this important aspect of your practice in your care.

According to Sarah Sharman to facilitate movement the body functions as an interdependent, interrelated scheme where the muscular, skeletal, and nervous systems work separately and collaboratively to produce motion. Our care focuses on analyzing the dysfunctional and functional relationships of this regional interdependence.

My good friend and colleague, Dr. Rick Ames, and I will attempt to cover the biomechanical, physiological, and neuromuscular aspects underlying manual therapy. And then, as you move into the hands-on portion, we will stress these concepts of what w-w-we have reviewed today. assessing joint function requires an understanding of what really happens with manipulation or mobilization. And we have to realize that the old historical description of bones, or moving bones back into places is not really valid any longer. But you will see from today's discussions, the effect of our manual therapy is improved motion and a beneficial alteration of motor control.

So let us start by looking at the osteological mechanics of movement and that is basically turned-termed Osteokinematics. Which is nothing more than a big word that describes how bones and joints move in relation to each other. These types of motions there are basically 3.

The first of these is called translation, which is really linear, and as to say, along a line. But this line is not only straight but can be curved, and then you have rotational movement, which is angular around an axis. But in most cases, particularly in human movement, it is a multi-segmental combination of this translation and rotation. Then this is dictated by the architectural anatomy of the joints that we focus on.

So when we start looking at motion, we have to review the standard references of cardinal planes of motion. I am sure you are all familiar with this, but we just go through it. Examples of frontal plane motion in-in human motion are things like flexion and extension, plantar, and dorsiflexion. sagittal plane movements are like lateral flexion, abduction, adduction, inversion, and eversion. And then examples of transverse plane motion a-are like supination and pronation.

And then with each of these motions, there is a point where there is an axis of motion that occurs. In some cases like in this middle picture where we illustrate the interphalangeal joint, there is a single axis of motion and the single-axis refers to what is called the instantaneous axis of motion. But in other joints like the knee, it is a little more complex because there is a combination of motions that include translation and rotation, and these occur in more than one plane. So when there are multiple axises of rotation, the composite of these axises of motions is called the evolute.

The takeaway from this comes from our motion palpation assessment of a joint in differentially diagnosing normal from abnormal joint motion. It is important to understand the joint-by-joint approach made popular by Gray Cook and Michael Boyle. It essentially states that joint architecture from the foot up alternates between stability and mobility in terms of motion. Because of this when joint dysfunction results in symptomatic pain, it can often be traced to the joint above or below the pain. A good example of this is when you sprain an ankle, and it loses its mobility because of this. The pain usually shows up in the knee because the knee loses stability in compensating for the lack of mobility in the ankle. I think it is pretty obvious that you can see manipulating the knee would not be the best location for most effective outcomes.

If we motion palpate joints, we try to evaluate the joint's ability to displace or resist displacement. And this is a way of n-not only assessing joint stability but also looking for indication of the joint centration or what is called the close-packed position. We also check to see if there is maximal joint surface contact, balance between the co-contraction of the agonist and antagonist, and even loading of the joint services. But do not confuse this with a closed-

packed exercise or the distal aspect of the extremity is anchored to the ground during the exercise.

We have to look at the open-packed position which really allows us to assess passive range of motion and this allows partial joint contact, and within that, we may be able to feel an imbalance between the agonist and the antagonist and then palpate on even joint motion. But do not confuse this with an open-packed position for an exercise where the distal segment is free like, in a seated leg extension exercises.

Man, if we move to look at Arthrokinematics, another big word, which just describes the way articular surfaces move in relation to each other. We can use this information in helping us differentiate motion between our palpation, whether it be static or dynamic palpation of the joint. But to do that, w-w-we need to look at kinetic chains and realize that when we evaluate somatic dysfunction using Sharman's approach to regional interdependence. We have to understand that there is more than one kinetic chain. That the nervous, the muscular, and the skeletal systems all have their own kinetic chains, but we are not going to talk about all this today. W-We will stick- stick with the articular chain. And in- within the articular chain, you will notice that there are two sub-chains. The postural and, and the kinetic which are Illustrated in the bottom part of the slide.

The postural chain is more about static posture and it is illustrated by this Brugger illustration that shows changes in pelvic tilt also alter the curves and the curves of the spine and, and then the way that the rib cage moves. And then the kinetic chain is more about evaluating dynamic posture. Man, this shows an example of how excessive pronation creates kinetic changes within the skeleton, from a functional perspective.

Joints have various degrees of freedom of movement. Most mobile joints have 1, 2, or 3 axises of motion and other joints have none at all. Like our teeth or the sutures of our skull. Each motion is dictated by the joint's architecture and then that is enhanced or inhibited by the muscles, the ligaments, the Joint capsule, fascia, and of course, the neurological motor control which then supply varying degrees of motion.

In addition to this gross movement, joints have accessory motion or joint play, and this really refers to the flexibility of the joint capsule. This helps the joint maintain optimal position and prevent loss of contact between articular surfaces. So, if we are looking at the actual joint movement, there are 3 fundamental movements, and then the first of these is called roll, which is pretty much like a tire rolling or, or on the ground. But, in anatomical terms, we have to realize that if there is too much roll within an articular surface, that can lead to dislocation,

Then there is glide and slide which is similar to a tire skidding on the ground, or on ice and this is sometimes also called translation. Then anatomically or clinically speaking, pure slide can create impingement and we see that when the humeral head slide superior and creates subacromial impingement, or we can see it in the spine with impingement of the articular facets.

We have spin and swing which is rotation around a stationary axis, and this, we commonly see with hip and shoulder and, and radius motion. But again, in reality, please remember that these occur in a combination in most movements. Roll and glide usually occur in opposite directions to each other. Like we see here with the knee.

Within joint motions, we have to look at the convex-concave rule, which basically states, the fixed end of a convex or a concave joint really determines the direction of accessory motion. Each side has its individual motion. So, when we motion palpated joint, we want to make sure to palpate the motion of the fixed end, as well as the moving end.

As you see in the picture here, if you focus on the green dots, you see each motion has a point where the axis of motion occurs. This is what we term, the instantaneous axis of rotation or motion and in like an interphalangeal joint, this axis of instantaneous or axis of motion never changes. But in reality, in human movement, that rarely ever occurs because movement occurs on different planes. When we have multiple motions in multiple planes, this instantaneous axis of motion is constantly changing. We describe the composite of these constantly changing movements as the evolute.

Most movement, as you can see, is in a curved linear post??? motion. It is always a combination of translation or rotation and that is what commonly happens in most body motions. This freedom of motion gives each joint the capability of having 3 translational, and 3 rotational movements resulting in 6 degrees of freedom of movement in all the cardinal plane planes. So what this means is joints should exhibit these characteristic movements, flexion, extension, right and lateral flexion, right and lateral rotation, A to P, P to A, lateral to medial, and medial to lateral glide, internal and external rotation, compression, and then distraction.

I think we all realize that since the body motion is really 3 dimensional. The actual description for 3D motion is called the helical axis of motion. And this describes some curved linear translation without rotation, and w-without any, any spin associated to it. but again, because motion curve occurs on a regular surfaces, there is no real pure planes of motion.

If we switch our attention to the kinetics of motion, which is the branch of biomechanics dealing with the forces causing motion. We really need to review Newton's Second Law, which is basically force equals mass times acceleration. This relates to our application of thrust with manipulation.

We use this in teaching our Chiropractic students, how to use their mass to deliver efficient directions of force during our manipulation courses.

Later in the program, you will learn how to use kinetics in analyzing athletic movements. So, when we review, we have to look at the different types of muscle activations and we commonly have, are aware of this, but we need to review, and have you remembered that different types of forces that muscles can produce are divided into these categories where concentric contraction is muscle force while the muscle are shortening. Eccentric contraction is muscle force while the muscle is lengthening. Isometric contraction is where there is no change in the muscle length, and then I would like you to remember that eccentric contraction produces twice as much force than concentric contraction with half the energy.

If we started this slide by looking at the bottom of the slide under a length-tension relationships. This refers to the amount of force a muscle can produce in relation to its actin and myosin cross-bridge connections. We see, in a resting state, there are a greater number of actin and myosin connections. When one elongates or shortens a muscle the percentage of cross-bridges decreases along with the amount of force a muscle can create. And this is called active and passive insufficiency. We see this very commonly in a condition called pattern overload. And pattern overload is when you do the, the same exercise or the same movement over and over again, repetitively like a racket swing, jogging, a particular weight lifting exercise, or pitching a baseball, or a, a cricket ball. and then what occurs from this is pattern overload creates these imbalances in length-tension relationships.

I think that most of us think about muscle function in what is, is just the concentric phase of the muscle contraction because that is how we were taught in school. We learned that the origin and then the insertion, and then we learn the concentric function of a muscle. I feel that this is carried over into our soft tissue techniques because we tend to work on the tight muscles in removing muscle tension, removing trigger points in the hope of balancing the soft tissue to allow appropriate joint centration and appropriate motion of the joint. But what I see many neglecting is the other half of the equation where the antagonist is also involved in co-contraction of the joint a-and creating joint stability. And I feel that this must be considered as part of our manual therapy. If we do not activate the weak antagonist while releasing the type agonist or vice-versa, how can we assume that there is balance and force available for joint stability and centration?

Research has provided many instances where this reciprocal inhibition of an overactive agonist, neurologically shuts down the neural drive to the antagonist. And this is basically what neurogenic inhibition is. This creates another condition called synergistic dominance and that is when the neural drive of a prime mover is shut down. Then the synergistic muscles that aid in the execution of that movement, now become the prime mover. When that occurs this leads to further decentration of the joint and a higher risk of injury and loss of performance.

The reason why this occurs is not only because of the changes in the length-tension relationships of those muscles but in their coordination of what is called force couples. When you have a synergistic action of muscle groups and this is illustrated in the illustrations on the, on the far right of this slide. Most cases, force couples are considered a-an gross movements but not that is not true in every scenario. But when you have this scenario of altered length-tension relationships from pattern overload, creating a reciprocal inhibition, and synergistic dominance then you have this agenesis of impairment of performance. I like these charts here because I think they are very informative, but I, I think the arrow should move in, in both directions since each component of these adaptive responses are the result of the body always sacrificing quality of motion for quantity of motion.

Then our neural plasticity, our nervous system creates engrams that quickly learn this dysfunctional movement pattern and then these circles move on to the next stage. Now, regardless if you would know what movement we are talking about. Whether it be everyday movement or athletic movements, there are various forces that act on the musculoskeletal system, and these are composed of tension, compression, stress, shear, torsion, or more times than not a combination of these things take place.

Now, I would like to switch our attention to the articular neurology of, of synovial joints. There are the primary innervation of synovial joints are 3 types of nerves. The primary and accessory articular nerves and then mechanoreceptors, and I want to concentrate on the mechanoreceptors today. We often think of these in our, our, our Kinesio taping techniques because these assist afferent communication through using the skin as a handle or in our internment, instrument assisted techniques. but it is interesting that joints also have this similar innervation like the skin. I find that fascinating because they allow the body to perceive where it is in space. This is critically important in athletic movement because controlling your balance is so critical. Controlling your balance outside your center of gravity is what I feel is the ultimate athletic skill. Therefore, our optimizing a mechanoreceptor function is really central to what we do.

As you can see, there are 4 types of mechanoreceptors. Types 1 through 3 are found in joints and periarticular tissues. Where type 4 are just free nerve endings surrounding the joints that mediate pain or nociception. When stimulated these type 4 nociceptors do not adapt. They just keep on fire. They just keep on screaming. And then this trigger, triggers muscle tension which then restricts motion from neurogenic inhibition and they get sensitized, and that increases pain perception. The nice thing about types 1 through 3 is that during motion, that stipulates the type 1 through 3 mechanoreceptors and these guys block type 4 nociception from transmission to higher centers.

The other thing you have to remember is when the joint motion is restricted or immobilized or even when the joint has decreased motion from like pattern overload, this stimulates the type 4 nociceptor firing. And this is where we come in because our osseous manipulation like joint motion and exercise stimulates type 1 through 3 nociceptor activity resulting in presynaptic inhibition of the nociceptor afferent transmission at the spinal cord level so it never really gets to the higher centers. I feel that this is how our manipulation helps relieve joint pain.

So let us take a closer look at these guys. If we look at type 1, Ruffini mechanoreceptors, there are numerous and subcutaneous and fascial connective tissue joint capsules, apophyseal joints to the spine and they are in the TMJ.

U-unique thing about these guys is that they are more numerous and proximal joints. They have a low threshold. They are slowly adapting and they are always active even when the joints are mobile. They discharged at a rate of 10 to 20 times a second and have a tonic effect on muscles. Alterations the discharge rate increase or decrease with active or passive manipulation, isotonic or isometric exercise, or when the pressure gradient of a joint is altered sufficiently like we see in when we cavitate a joint.

The other cool thing is they supplement our visual components of balance and those cutaneous mechanoreceptors in the skin. But alternative, alternative so if you damage the joints capsule, it also causes degeneration of type 1 mechanoreceptors. Then the reverse occurs, this can lead to impairments of posture and balance.

If we look at type 2 Pacinian corpuscles they are, they are kind of strange nerve endings because they have a multilaminate connective tissue capsule and closing the terminal end of the nerve. They are present in periarticular tissue, fibers capsules of the joint, and the periosteum. These guys are a little different because they are more numerous in distal joints as opposed to proximal ones, like the type 1's. They are low threshold. They are rapidly adapting. And for this reason, they are really inactive when we immobilize the joint. They only become active at the onset of movement, and then they emit a brief high-frequency burst that occurs 20 to 40 milliseconds prior to the type 1's firing. So there are main function is to signal joint acceleration and deceleration and they have a phasic effect on the muscles.

And then type 3's are combined to intrinsic and extrinsic ligaments and they are identical to the Golgi tendon organs that were familiar with. They are found in collateral ligaments of the knee, cruciate of the knee, longitudinal and interspinous ligaments of the spine. Their high threshold slowly adapting but like type 2 they are inactive when we immobilize the joint because they only become active at end ranges of motion. So, their function is to mediate breaking reactions, directions of motion, and warn of harmful movements.

Then back to the type 4 nociceptors, they represent a small plexus of unmyelinated pain receptors. Remember that they are active with mechanical deformation, tension, and chemical or mechanical irritation. When you have an injury that causes an excess of inflammatory exudate, when the concentration of histamine or bradykinin gets high. These guys set off and they continue firing as mentioned causing muscle tension, increased pain perception and this leads to inactivity from neurogenic inhibition, and then if unchecked they continue firing into the upper centers of the brain, and this causes sensitization that we recognize as chronic pain.

So let us move our attention to how we assess joints and we really ask ourselves a lot of questions. How do we assess joints using these biomechanical principles that I have just discussed? let us look at a few theories of why joints become restricted? Why they lose motion? What exactly causes the joint to lose its freedom of motion? And really the answer we see most often is that it is related to so-some type of trauma.

I have, you know, touched on the concept of pattern overload, creating changes in length-tension relationships which then causes adaptations to motor control. But in reality, there are not really a lot of explanations out there and we have not been able to really pin down the precise reasons. Current research does not really explain everything but here are a few of these that I would like to talk about. Paterson and Steinmetz showed that there is a neurological patterning causing decentration of the joint. This is because the brain will pattern quality or quantity of motion over quality of motion and on our brain neuroplasticity quickly creates the engram for the joint function to adapt to the changes that are imposed upon it.

The next research article is by Gattermann and Koch, who really questions this classic chicken or egg question? Is it the joint centration that causes muscle imbalance or is it the muscle imbalance that causes the loss of joint motion? Well, their research agreed with Janda's explanation that it is really the muscle tension and imbalance that are the causative factors calling causing alteration of joint mechanics. Then Triano created a research paper that proposed a biomechanical or a biomedical model which looks at the mechanical forces acting on the joint that alter its motion and what effect that this has on periarticular tissues.

Normal motion occurs when appropriate joint stiffness support centration of the joint when in proportion to the loads applied to it. Triano reported various stresses cause buckling to articular tissues and these stresses include prolonged postural positions which sort of explains, why we sit here for a long time and then we get up and we feel a little stiff and achy. Well, over time this creates tissue fatigue below the injury threshold, which results in buckling of articular tissues. And then, in addition to this, chronic postural change. You found out that buckling events come from single events like trauma or rapid loading higher than 500 pounds per second. Static postures that have progressively increasing loads, and then he also showed that chronic vibration also reduces the injury threshold and then creates buckling in the soft tissues. But then he went

on to prove that we can resolve these buckling events by the application of external forces and actually restore movement through restoring normal movement patterns, through corrective exercise, and through our manipulation.

As we palpate, we really analyze joint play and joint play as relieved as small discreet ranger motion of passive movement, palpated in the neutral position. We look for the quality of the joints' resistance to movement, in this neutral, loose pack position. This should have a really small magnitude springy feel to it and when we do not have this springy kind of reaction to our motion palpation, this is one indication of joint dysfunction.

Now, we have all seen these joint range of motion diagrams, and I will go through these rather, rather quickly cause we have seen them before. but be aware that, you know, there are neutral, active, passive physiological barriers and re- and play zone, elastic barriers joint play zones Para physiological spaces, and then the absolute and is the anatomical barrier.

Our palpation attempts to analyze is these different aspects of these barriers during motion palpation. Our motion palpation also looks to discriminate differences in tissue, tension, texture and to assess the end range or, and feel of the joint. This is evaluated by applying additional overpressure to the joint at end range where we feel a sense of it increasing restriction to the tissue with firmer resistance until it stops its motion. And we are actually looking to find it as it comes as complete as it can be, but we also have to judge the quality of the end feel. So let us look at the qualities or different qualities of end feel. Some are normal. Some are abnormal. I have listed a few examples as described by Magee. In here you will see that there are normal end feels bone to bone being like elbow extension. Soft tissue approximation being like elbow flexion or knee flexion and then tissue stretches similar to when you bend your finger backwards.

But there are also abnormal end feels, and in order to tell the difference between these 2, these are basically very similar to what you would feel in normal end feels. But they occur where you would not see them, within the normal range of motion, where it is not expected, and that is what makes them abnormal. If you have a bone to bone end feel, for instance, in the middle of a range of motion that stops with that end feel, that commonly occurs when we have like osteophytosis. spasm is, is basically self-explanatory. That is when muscle spasm like you would see in a torticollis prevents normal range of motion. Then springy block is when you have some type of intra-articular palo-pathology that is very commonly seen in the knee or the TMJ. Then empty is when pain blocks the motion or when the joint have so much hypermobility that they are, there is just excessive range of motion. The last of these, we need to look for is, is capsular patterns and we need to watch for these to tell if our patterns of, if these patterns of stiffness are leading to capsular fibrosis. In this feels like a thick tissue stretch but not where you would expected in the range of motion. Capsular patterns, only occur in joints with muscular

attachments. So, for instance, in the sacroiliac joint and the distal tibiolo- tibiofibular joint, that is not going to happen there.

It is important to show consistency in evidence for what we find in our motion and palpations. So, so we can provide outcome measures for what we are doing. Currently, w-we have not standardized the process and there are not enough outcome measures to really defend our, our credibility.

Our methods are not as sensitive or reproducible enough to produce reliable outcomes. And so, to better help us show better consistency. One of the tools we would like to introduce you to is algometry. If you are not using it already, this measures pain threshold, and face it, our assessment could be better and this is one tool that can help us. Algometry has excellent reliability and repeatability. Correlates well with other measures and it is a really good tool to, to defend and add credibility to our outcomes in ma- manipulative assessment and in our treatment.

Another tool we use to direct our decision-making with what joint to manipulate, is what we find in the clinical presentation. As we palpate joints, we look to identify reliable indicators that tell us which joint to manipulate. There is a lot of data out there of indicators that help us identifying that, and here are some more reliable studies to help us with what that looks like. We are more familiar with Triano's review of methods used by chiropractors to determine the site of applying manipulation. and, and he uses and made famous the parts acronym, which is basically pain asymmetry and bony landmarks, alterations and range of motion, and as refers to the postural and kinetic chains that we have talked about. Changes in the tissue whether that be temperature, texture, tone, and then special tests revert back to alterations and motor control with gross movements. And, and the kinematics that we have already discussed. But he was not the first and was not the only one.

Back in 2009, Chase had his acronym called TART, which is very similar tissue, texture and temperature changes, asymmetry of, of bony landmarks, range of motion, changes, and tenderness. Even before him, an osteopath by the name of Dowling, had his STAR acronym which again is very similar. Sensibility changes, tissue texture changes, asymmetry landmarks, and then alterations and ranges of motion.

We recognize motion palpation is larger, largely subjective and that is really a problem for us. It has good inter-rater reliability, but pretty bad inter-rater reliability. This caused us to lose consistency in what we are reporting and how we report it. We need more standardization in our approach along with a mutual understanding of these biomechanical principles in what we are, we are trying to assess. We encourage you to try to become as consistent as you can in your assessment and your reporting.

Another tool we would like you to incorporate is called the Orth tool kit. It is an online app and it has a lot of additional outcome measures for extremities like the lower extremity functional scale, the Foot and Ankle Disability Index, the knee injury outcome score, and lots of different outcome measures for the shoulder, elbow, wrist, cervical spine, lower back. And it is interactive between you and your patients. It will track your progress and it is HIPAA compliant. And I am not sure if you understand what HIPAA compliance is, since that is kind of a, a thing in the States but that is a, a regulation that controls how patient health information needs to be protected and who can see it and who cannot. This this app that you can see online here is, is fully compliant.

One of our tools. Another one of our tools is in treatment is, is joint mobilization. In, in my time we kind of ignored mobilization because we wanted to be identified for our manipulation, not mobilization. But as time went on, we realized that mobilization does have it placed in our manual therapy. It is basically a form of non-thrust joint manipulation typically applied within the physiological ranges of motion. their passive, rhythmic, graded movements of controlled depth and rate and they can be applied with fast or slow repetitions at various depths. Movement can be applied singularly or repetitively within or at the physiological range of motion. But the thing that separates it from manipulation is that there is no thrust or impulse. This lack of thrust is really what separates it from grade 5 manipulation that we are familiar with. But it also has the goal of restoring joint mobility.

You will see in this slide that grades 1 and 4 are small amplitude movements at the beginning and end range of joint play, respectively. Then grades 2 and 3 are large amplitude movements at the beginning and mid-range of joint play. At the bottom, grade 5, the one that we all know and love the high velocity, low amplitude thrust at a-anatomical endpoints of the joint. Now, I think I am pretty close to the end of my time here. I think I will stop at this point. Maybe answer some questions if you have any take a little break and then I will let Dr. Ames take over to tell you a little bit more about manipulation. Thank you for your time and attention.

Christine: Thanks so much, Tim. That was really just absolute terrific and very informative. I really love getting that concept of quality of motion over quantity of motion. I think that is a really important concept particularly with athletes that we need to think about when we are, when we are evaluating the kinematic chain, which is a hot topic now. but thank you. I do want to you know, really appreciate all that you have contributed to the sport, to the profession and providing teams for games around the world, for a very long time for FICS., and also your expertise at the University of Western States as associate professor and program director of Sports Medicine, not to mention Colorado Chiro of the year, 2 times. So thank you for all you have done for our profession and for joining us today and helping the students grow and learn more as we kind of dive into sports chiropractic.

Tim: Thank you, Christine, and, and thank all of you out there. It is been a pleasure to have the opportunity to speak with you and I, I hope you learned a lot of things from, from our discussion today.

Rick: I do not have... I needs that [smash noise]... hmm, some reason I am not getting my notes. I am going to stop sharing and, and change this.

Short break in video:

Christine: welcome back everybody and I would like to introduce Dr. Rick Ames, who will be presenting the last portion of our module today, functional peripheral joint technique. This once again is getting at you ready for your hands-on module. So just as a reminder, when we see you at your hands-on module, please come appropriately clothes so that we can do all the adjusting techniques on you, upper and lower extremity. If you are doing just an upper program, just a short-sleeve shirt. If you are doing a lower, shorts as well. We will really be looking forward to seeing you all at your hands-on modules and get be working now. At those modules there will be no powerpoints, it will all be hands-on the entire time. So super exciting content that will be going through with you there.

Rick, Dr. Ames is a senior lecturer in the discipline of Chiropractic at RMIT University of Melbourne, Australia. There, he teaches diagnosis technique and management as well. He has graduated from LACC. He has a fellowship in Orthopedics and Neurology. He has worked with National Olympic Weightlifting and Table Tennis teams based out of Melbourne, as well as focusing on treatment and rehabilitation of amateur and professional athletes in his private practice. He is organized Health teams of chiropractors there in Melbourne for major sporting events.

Dr. Ames is also coordinated the sports chiropractic and postgraduate programs for RMIT University and Federation Internationale de Chiropratique, FICS. He is actively involved in the presentation of postgraduate seminars and chiropractic as well as publishing numerous articles with sports chiropractic focus. His main clinical practice is emphasizes postgraduate study and research continues to be a sports chiropractic focusing on extremity conditions. He is published and lectured extensively on management of extremity conditions particularly on how to treat patients in everyday practice, super applicable to today. So welcome Dr. Ames, very excited for you to come all the way from the other side of the world, at a way different times on.

Rick: Thank you, Christine. hello everybody. These things have changed quite a bit in the world over the last year and a half, and the last year, when we are on lockdown here in Melbourne we had a 5k rule, you could only visit the areas within 5 kilometres of where you live. Well, 4.8

kilometres from where I lived was this beautiful State Park known as Westerfolds and in Westerfolds lives what they call a mob of kangaroos. It is really wonderful to be able to walk to there, drive to there and be able to see this during lockdown. So that is how we will start today. I want to acknowledge first of all, Dr. Brian Nook who presented a lot of this material at the Madrid seminar back in December 2020. I also want to acknowledge the excellent presentation that Dr. Ray did today.

I thought it was fantastic. A couple of the our final year students who partisan videos that I am going to show in a minute, and you guys, you are our inspiration. This is what took me from being what I thought was an ordinary chiropractor and to a much better chiropractor was a seminar for FICS that they had in Hamilton Island in 1993. It just changed my whole focus in my whole ideas of, of doing adjusting. There is a- very much we learned a dysfunction-based functional technique, so they call a couple technique. I tend to call it functional technique because it is not just straight adjusting it is based around the coupled concepts that I am going to be talking about.

Most of us have learned a more traditional approach where we diagnose a dysfunction in a joint, and then and then we adjust it. But we can also take some of these coupled concepts and incorporate those and improve our ability to function, and to adjust. The coupled contexts, number 1, Obviously, you are- you want to make sure that you are around the joint capsule. you want to get as close and into the joint capsules possible when you are doing your palpation. You want to spring the joint. This is something that you have always learned in your motion palpation, and Dr. Ray was talking about with either your joint play or end feel. and you look to find the most restricted position but the other things that you want to do is you can put them in a coupled position. You might add 2 or 3 different positions to that joint and look for the most restrictive position.

You can add muscle contractions so you might be taking a contact around the hip in a flexion position, and you contract the quadriceps, or you contract the psoas. and then the other things that you can do, you can add weight-bearing and sport-specific, so you can do these things in a standing position, you can do them in a position, say a patient who, who was lifting weights. I just happen to use an old wooden stick and get them to simulate a position for say at the end of a clean and jerk. In that particular position, that is when I do my motion palpation. Use that sport-specific position particularly if they are complaining of pain in that particular position and of course, you adjust then in the position of greatest restriction.

These are what we traditionally learned you know, we learn, you know, kind of adjusting for dysfunction. We looked at open and packed positions, that is when we would do our adjusting. But then like I said, we can add in these other coupled aspects, and particularly what I liked is that you can, you can bring in your assisted techniques, your drop pieces, your instruments if

there is a range of different type of adjusting instruments that are in our profession and developed by our profession that make it to If we use a coupled concepts and coupled the approach to doing this. that we can add, add those to our- the way we do it. Technique principles you guys gone over this before, you would have done it in your undergraduate and you should be doing it now.

One of things, the principles that I find that when we do a technique is the same as in sports. We do these pre-performance routines. You watch any of your athletes. They do pre-performance routines. They go through and they start off in that pre-performance, they imagine what they do, we focus the attention, you execute and then evaluate and we do the same thing. When we do an adjustment we ready ourselves, we should be imagining the anatomy underneath our hands, focusing our attention, concentrating on what we are doing and then you know, the Nike just do it, and many times that is what we do with our manipulations with our adjustments.

Tim talked about this. why these benign pain syndromes develop? Now there is a professional jargon that is out there. I do not shy away from the fact that I utilize the term that chiropractors called subluxation. I tend to use it from the gathering consensus approach. and I know in the book by Bergmann and Peterson. they talk they would have turned it subluxation joint dysfunction, whatever you want to call it. it develops because there is changes usually within the kinetic chain, maybe this dyskinesis. What Tim was talking about changes in motor control, changes in utilizing synergistic muscles rather than the primary contractors, a post-trauma, whether it is micro-macro trauma in overuse type situations or if there is been pathological change. What the patient ends up with is many times just a benign pain syndrome. You cannot link it to one specific aspect.

And I have always, in working in sports, think it is important. We have the professional jargon that we use of a subluxation. What we have to remember is that in the medical profession their definition of a subluxation is at this end of the continuum just below a dislocation. Whereas, usually, we had talked about that subluxation at the other end of the continuum which has that fixation hypermobility type of aspect, neuromechanical aspect. Make sure that when you are discussing with the practitioners in other professions that you, you understand what your definitions are and make sure that they understand what their definitions are. So that you talk in the same language, obviously, the contraindications to adjusting, you guys have covered all of this in several different places. Both the red flag and cautions and modifications because you are going to come across all of those in our practice and so you can work through those.

I like using these particular definitions Bergmann, Peterson's always had this again, you should know this. You would have covered this in your undergraduate using joint manipulation as the overreaching concept. For us as chiropractors, we use that specific form of joint manipulation, we call it adjustment. chiropractors typically have been looked at, and utilize the short leverage

aspect of, of the adjustment, but we also have many long lever adjustments. Obviously, there is a controlled force, lever direction amplitude, and velocity. I think the big word here is controlled and that is where that pre-performance routine comes into it, it allows us to do the control.

Tim talked about joint m-mobilization using those grades developed out of the European manipulation models Maitland, highly influenced by cattle born and some of the UK and European approaches to manipulation. We do teach a range of mobilizations. and Tim went through those grades 1 to 4 with the manipulation being in grade five. If you wanted to classify it, we have got joint manipulation procedures, you know, our mobilizations in our adjustments and also adding traction to do that. Then there is soft tissue manipulation procedures, I will show you a soft tissue manipulation at the end of this talk.

So really manipulation that some of the early work by Roston and Wheeler Haines, where they looked at cavitation of the joint and producing that cracking noise that when they separated. So they have, using x-rays they filmed and they found the initial separation 1.8, and as they increase the tension, it jumped to 4.7 and there was a cracking noise. Their idea was that this traction like said, it tends to invaginate the, the, the synovial fold and capsule. they a forced a part of the, of the intra-articular pressure drops and this gas bubble forms, and they felt that the collapse of the gas bubble was what produces the audible crack or the cavitation.

However, subsequent studies suggest that there is a different mechanism involved. It is about a refractory period of 20 minutes and that is been confirmed by other studies, one of things is that during mobilization, so your grades 1 to 4, there, there is no cavitation, and there has been research suggesting that a-at least for a flexion of the metacarpal, phalangeal joint mobilization is not as effective as actually the manipulation with the production of the cavitation for increasing flexion. You know studies by Kramer on the zygapophyseal joints in the spine shows that there are differences in there looking at side posture, upside joints, downside joints, gender, and of the fact that there was more cavitation on joints that are sore more gapping in the joints that cavitated. This is it back again from Roston and Wheeler Haines, looking at two types of patients, looking at the typical one but this one showing a wide preliminary separation. So perhaps somebody that is in either, hypermobile, hypermobililty or generalized hypermobility in the way in which that cavitation or cracker.

Study by Kawchuck was very important in that they show that the mechanism joint cracking or the cavitation is related to the cavity formation rather than the bubble collapse. That cavity formation is known as tribonucleation process where the opposing surfaces resist separation until the critical point where they separate rapidly into vapor cavities and do not collapse instantaneously. This tribal nucleation so it is a different idea than that collapse of the bubble that was originally suggested. They found that there is a 20-minute refractory period before the next cavitation.

Start looking at about biomechanics of spinal manipulation. As Tim noted, we are utilizing these peak force-time profiles and teaching students on how to manipulate. We are looking at, you know, the pre-loading force into the into the phase, into the thrusting phase and then resolution phase and looking at this change in force or the rate of rise, and we also look at the speed.

Another thing that we look at is something, which I think is important is the incisural dip or this notch that sometimes as the pre-loading force, people get a little bit of a notch and when they let the tension go out of the joint when they are taking an adjustment. sometimes I, I found that, that can be a painful aspect. So, Herzog did a really nice review on this. The peak and preload forces very dramatically, depending on location, cervical thoracic sacroiliac and whether we are using a hands or using a adjusting instrument. The treatment forces very dramatically between clinician. Plenty of research that is come up out of Canada in regards to that and the fact that both experience has a big aspect of it and gender may play a part in it as well. The detail force mean to might not be the important characteristic of success while the direction of thrust might be. We have got multiple hypotheses, is not in mention, there are quite a number of hypotheses out there. Many things, have not been proven, we have got lots of information out in or out in the literature that we can look at his background for our manipulation.

This really nice review article that I came across by some osteopaths out of the UK looking at the different theories of changes with particularly spinal manipulative therapy. Again these biomechanical changes that are produced, which Tim Ray talked about, he talked about the buckled motion segments may be entrapment. This has been around awhile, synovial folds are in these voids adhesions, and then Tim Ray also talked about changes in the musculature, and so their ideas that these changes in spinal biomechanics trigger a change of neurophysiological responses.

You look at this study, they have this what I think is a quite nice, a representation within the article which looks at different aspects of activation of mechanoreceptor of nociception and efferent fibers. Look at changes in the alpha and gamma motor neuron excitability as well as cortical, spinal excitability, we look at autonomic activation. All of these having an effect on analgesia, and so changes in pain. We have an effect by activation of the sympathetic nervous system and a activation in what is known as the hypothalamic-pituitary-adrenal axis, which changes tissue healing.

One of things they say in the article that has been well established that both the sympathetic nervous system and the HPA axis plays a significant role in modulation acute and chronic inflammation and are involved in pain relief and teal tissue healing processes. Then one that has been around for a while. Looking at the gate mechanism that Tim Ray talked about where we,

you know, alter peripheral sensory input. We get this, hypogeusia from segmental inhibition and then again, there is activation of descending pain pathways.

These are all theoretical aspects of particularly pain control that we come along and that we utilize within our background to manipulation. A couple of things that neurological conditions and to mention about this particularly in regards to, to neural plasticity. That is the brain learns to be dysfunctional, and that many times it goes through a maladaptation process that might be associated with some of the chronic pain. Some of the research has shown that the speed of thrust is very important and I personally think and look at some of the sports psychology that the visualization of positive outcomes. Going back to that pre-performance flowchart.

This visualization that we have both as a practitioner and that we impart into our patients is very important. Of course you know we talked about particularly so you go back to what Tim Ray was talking about, about those mechanoreceptors that when they are stimulated you get some inhibition for better word of the nociception, the nociceptors. Really nice article, in I like to look at different articles that help with my understanding of what happens in clinical practice so there, there is this idea that if you try change pain without changing motor control, it is going to result in the return of pain.

Out of Haavik and Murphy's article looking at where you have got this abnormal sensory motor integration with altered motor control that by incorporating, in this case spinal manipulation into that flow that you end up with appropriate sense of motor integration and accurate motor control which improves your function. There is also an article just lately by Malayil in Texas looking at dual-task performance. Looking at both tasks and posture and looking at manipulation of the extremities they used a pattern of adjustments, and found that it definitely improved the this dual-task performance.

We know then that our manipulation has activated in pain reduction. We know about it activating mechanoreceptors particularly but normalizing both mechanoreceptors and nociceptors. We know about inhibiting the central transmission of pain, and I do not have a problem with the idea that there may be some placebo effect associated with all of this.

So our therapeutic approaches that, that, that we use. we want to see decrease in the patient's symptoms. We want to change objective findings even though some of them are more subjective, and less objective. One of the ways that we can objectify is perhaps using some of the things out of the Orthotool kit that Tim Ray discussed. When we are looking at adjusting if you are just doing straight adjusting maybe we need to change what we do to fit better with our patients, who are the athletes. So, again those two concepts, dysfunction-based functional technique that is mainly what we are going to be going about. Like I said, you can take some of these coupled concepts and incorporate them into your normal traditional approach to adjusting.

We are going your, your traditional, I have already gone through that, so we are going to look again about the coupled motion contact around the joint capsule, spring the joint, find the most restrictive position add in muscle contraction, add in different aspects of weight-bearing that are perhaps sport-specific, sport-specific position, but also you can add in equipment. So have the patient grab onto a tennis racket. Have the patient grab onto a cricket ball. Have the patient grab onto a volleyball or water polo ball, or hockey stick or baseball bat or whatever and during our motion palpation assess with that equipment or in the position that they are utilizing within their sport. While we do with this, we feel for springiness in multiple positions. We feel for springing this in coupled positions. We do not just do it in a neutral position. We might add in flexion-extension, we might add in supination, pronation, we might add in internal, external rotation, and then we can add in those muscle contractions like said we can add in weight-bearing or sport-specific positions on this. We find them most restricted direction of movement and then we adjust the joint in that position with an impulse-type thrust. We started looking at a quick screens, you saw the, the picture that Tim Ray had of the kinetic chain looking at the changes in kinetic chain with excessive pronation. I started making up some motion palpation approaches for myself. Basically, I just call it pelvic hip drop. I get them to bend the knee, I may add in a transitory or a sliding action, and then I will add in rotations. So let me just play you this video. Let us see if it will play.

Video

I just found that there were many times where I would have patients with a low back pain, a sacroiliac pain that was not responding to our normal treatments. I started looking at the hip. One of those general aspects of motion palpation that allows me to say, "Well, the, the low back seems to be moving fine, the sacroiliac seem to be move fine but the hips are moving awfully and therefore that maybe is where I should be looking at reintroducing some motion.

Video

The video cut out at the distal tibiofibular joint and that is the subtalar joint. I use with this general kinetic chain palpation. It lets me focus on which joint I should be paying attention to, again we cannot motion palpate every joint on every patient, particularly, if we are going to be looking at function in combination with perhaps pain, but definitely want to focus on function.

When we are looking at hip, we can do a, a range of, of quick screens. We can just do flexion. We could just do internal and external rotation. We could add in abduction and adduction. Brian's picture here is probably a nice combination where he is got flexion, internal and external rotation. You can see this is where these coupled theories or the coupled approach comes into it. It is right down into the joint system. It is doing a coupled motion of both flexion and in this case, internal

rotation and then flexion and external rotation. You could do things like extension and internal and external rotations as well. Looking at it is this, you can either do them singularly or then come on down and start doing them as a couple. You spring in this particular around the joint. In this case, you actually work your way around the entire femoroacetabular joint, feeling for the point of greatest restriction. If we wanted to, we could bring in things like the sartorius. We could get the patient to contract the psoas. We could get the patient to correct to contract the quadriceps. We could get them to contract the hamstrings. We get them to move the foot.

Now bring in a range of different aspects and of course, some of these you can do in a standing position so you throw them up into a weight-bearing position. But you put them up into a weight-bearing position and obviously it is going to be much more difficult to do flexion and most of the joint. But again, you could get the patient to bend the knee, which creates a flexion inside the joint. You look at their particular sport-specific position to do these motions. So same thing in the knee you know that we, we look at we can do singular ones but in this case we are doing a flexion with internal and external rotation. You could do this medial to lateral, lateral to medial. This is done in a neutral or in the extended position which you could do the same thing in a flexion position. Same with the fibula we can put the fibula when we are testing A to P, P to A, we can do this in a flexion position, we could also do it in an extended position. Many times I do both of these in a weight-bearing position particularly if patient is coming in complaining of knee pain in a weight-bearing position and staying with the patella, I have got them in a neutral lying position. You could do all of these in a standing position or in a closer to a sport-specific position.

With the ankle and foot, one of the things I do find that is really important, just thinking about the superior and inferior aspect of the fibula the fact that during the one of the most common sports injuries, the ankle sprain, particularly the inversion ankle sprain, what we tend to find a lot is an inferior fibula with a posterior fibula and but we have also got to make sure that the what is called syndesmosis is not compromised. So, doing our motion palpation of compression also allows us to assess instability in that area.

We could do things in the mortise joint. In this case we looking at A to P, P to A, in dorsiflexion and plantarflexion. We are looking at the subtalar joint, one common conditions you see patients who were doing lots of running particularly social running, but also in the higher levels in track and field is a problem at the subtalar joint. The subtalar joint is the one that tends to lose flexibility in ankle sprains as well as the talus in the mortise joint they tend to have problems with dorsiflexion.

You know, we can look at all of these different areas. We can add in dorsiflexion, and plantarflexion where we look at them. Perhaps we do A to P, P to A, add in dorsiflexions, look at the cuneiforms in the metatarsal, phalangeal joints maybe add dorsiflexion and internal rotation dorsiflexion or plantarflexion external rotation. So again, you can couple all these different

motions. Same thing with the toes, just they always get asked about a patient just before they leave the room. They go, "You know I stub my toe and it is it fractured?" best way to tell about a fracture compress the joint, add a bit of rotation if they are really painful, yes this is a good possibility that the toe is fractured.

I tend to find it was actually Mark Charette, a lecturer on extremity manipulation adjustments that I saw that he had a certain pattern of fixations and so I have not really been thinking about that. I started looking for myself and this is what I found. I found that there tend to be common fixations. I keep those in the back of my mind so when I am doing the quick, quick screen, that is one of the things that I am looking for. Things like an anterior talus after somebody has an inversion sprain, something like a posterior calcaneus, and patient comes in with plantar fasciitis, things like a medial navicular, post fracture of the, of the foot. They might have had a fracture dislocation up at the tibia-fibula area. Many times you will find this medially fixated navicular and cuneiforms are associated with that. A quick screen in the upper extremity you can use long, axis traction, you look and feel for tension in the different joints.

Video

All these motion palpations, when we look at doing these as an adjustment, we are going to do the motion palpation, and then many times, we will have the position that we can actually do the adjustments at that time. We want to look at the AC in the SC joints. Looking at these coupled ideas while I have given you single motions here particularly seated, horizontal, abduction, and adduction many times. You might substitute your fingers for your thenar, or for your pisiform but I tend to do use the thenar and do the adjustment at that time. I do find that these lend themselves to also using an instrument.

Looking at the glenohumeral joint and this is a really good joint in bringing in many of these coupled ideas. For instance, you can bring in abduction and external rotation, and while they are in that abducted, externally rotated position, test internal rotation or the same abduction and internal rotation. Not only test internal rotation but test external rotation. You can utilize this with bringing in equipment which is important. Doing the different ranges of motion palpation to kind of screen through but also, you can go ahead and test and adjust with an impulse with these patients. I do think in your quick screen of the, of the shoulder, there is enough information out there, enough research out there, suggesting that dyskinesis of the scapula system has a big effect regarding a range of particularly overuse conditions. You should always do scapulohumeral rhythm do it in abduction, do it in flexion , take a look at the clavicle as well.

Quick screen of the elbow again, you can do it in flexion-extension. You can do medial-lateral, lateral-medial. You could combine the two of these together for the most part. The pictures showing medial-lateral, lateral to medial in an extended position, but you could do this in a

flexion position as well. Same thing with the radial head, A to P, P to A, now we do it both in supination and pronation, so you should do both actions, and of course, you can set yourself up while you are doing it, to do it as an impulse thrust at that time. Same thing I have used to see I was taught that when people had problem with extension of the elbow, it was always called a posterior ulna. But instead, I found it was quite commonly a superior ulna and it did not shift the olecranon was not centered within the joint and it was seemed to be shifted superior.

I definitely use this a lot with any of my elbow conditions. Wrist and hand are very easy to do. A lot of much as the ankle and foot, a lot of the coupled ideas, so, like the idea of the A to P - P to A in supination and pronation of the different carpals. Same thing you can do radioulnar deviation, or looking at distal radioulnar joint and you know, looking at doing it both in supination and pronation. I tend to find a lot of risk problems has the scaphoid just does not shift well from its lateral position into its medial position and you will find that many times in either or supination or pronation.

Same thing we should look at the metacarpal phases, particularly any of the athletes that have sports where they involve equipment, whether you are looking at tennis or hockey sticks or doing weightlifting, and again we look at the thumb and finger joints. I have a, a range of different fixations that I have identified as a pattern. You should be doing this yourself, you can use these ones. Keep them in the back of your mind when you are doing work. Just to quickly finish up here, we have finished looking at the joint adjusting, at motion and using the coupled motions to test the joint and whether if necessary to then adjust then.

We can do our soft tissue adjustments, Brian Nook was the one who I first heard talk about what they called grip and rip, which is basically this post-injury collagen-binding so adhesion scars and adhesions in the soft tissue. You can use it on the different muscle systems and on the myofascial slings. Myers, If you have not looked over anatomy trains admires a myofascial slings, you can use it in relationship with that. There is a dysfunction in the tissue flexibility and what we do, we look for the barrier that is there within the tissue and then we can use manual muscle testing or functional muscle testing to give us an idea just as a contraindication to your, obviously, inflammation and pain. You do not want to do a high velocity, low amplitude thrust. When you have inflammation or you have particularly damage to the tissue, we are going to take the tissue to the barrier and we apply a high velocity, low amplitude thrust in the direction. I use the drop piece table a lot with this, as I find it just aids my ability to do it.

That is what I have for today. Thank you very much for listening and am hope I was able to give you something to start in your practice on the week on Monday.

[End]