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EDUCATIONAL TECHNIQUE

Enhancing Palpation Skills Through the Use of Stereognosis Drills

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Context: Musculoskeletal palpation is taught in our athletic training programs as part of the injury evaluation process. However, as palpation skills are taught, the focus is oftentimes on accuracy of surface-anatomy landmarks instead of the ability to discriminate qualitative information such as tissue tone, spasm, or pain response from the soft tissue. Because palpation is foundational for evaluation and intervention, a need exists for further development of this skill.

Objective: Provide educators with instructional techniques to enhance palpation skills.

Background: Manual medicine techniques are increasingly common in athletic training and require superb palpation and soft tissue discrimination skills. The ability to detect large and small differences in tissue qualities during orthopaedic evaluation can lead to a more accurate assessment as well as enhance manual medicine intervention techniques.

Description: We describe 4 activities to enhance palpation skills (coin discrimination, sheet tension, vacuum-immobilizer assembly, and spring-scale compression). Each activity is presented with progressions to improve the foundation of a student's palpation skills and provide advanced training to better refine palpation skills.

Clinical Advantage(s): Integrating tasks to improve palpation skills throughout the athletic training curriculum may help improve student confidence, accuracy, and precision while performing patient evaluation and manual medicine interventions. Improved ability to detect and discriminate musculoskeletal pathology can lead to more accurate assessment and efficient intervention techniques.

Conclusion(s): Palpation is an essential skill in musculoskeletal evaluation and intervention. With consistent and progressive instruction, this skill can be practiced and refined, improving student confidence and skill application.

Key Words: Skill instruction, manual medicine, critical thinking, assessment techniques

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Enhancing Palpation Skills Through the Use of Stereognosis Drills

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INTRODUCTION

It is common for today's athletic trainers to perform increasingly complex evaluation and rehabilitation techniques as they diversify in skill set and practice setting. The use of manual medicine techniques in the profession is on the rise as athletic trainers seek new ways to rehabilitate their patients. These techniques often require the athletic trainer to palpate superficial and deep structures of the body with great accuracy and discrimination. Anecdotally, many athletic trainers report difficulty with their ability to feel and discriminate the local soft tissue. The concept of *stereognosis* was first introduced to the medical world by Hoffmann[1] as an individual's ability to recognize matter by touching it. The ability to discriminate different objects and shapes is critical in palpation and manual medicine applications and thus important for athletic training educators to teach and develop over time in our students.

A substantial body of literature exists demonstrating acceptable intrarater reliability with generally poor interrater reliability with static palpation of anatomic structures.[2–10] There is evidence to demonstrate improved palpation skills as the result of a structured training or educational program.[11–20] Reliability of landmark assessment[11–16] and palpation pressure[17] improves when using specialized or experienced practitioners. Additionally, errors in force production are reduced after training sessions are performed.[18,19] Lastly, improved accuracy when locating low back spinal levels has been demonstrated with anatomical education on shape and morphology of each spinous process.[20] Collectively, these studies demonstrate the component skills of palpation can be improved with proper education.

As athletic training practice standards and educational competencies have evolved toward competency-based education, perhaps one consequence has been a focus on outcome rather than process. When applying this to teaching palpation as an evaluation skill, we tend to focus more on accuracy of palpating specific landmarks, instead of what can be learned from palpation of the structure. The qualitative information gained from palpation, such as tissue tone, spasm, effusion, or patient pain responses, can help aid clinicians in their musculoskeletal evaluations and treatment sessions. As educators, we should be careful not to focus solely on teaching students accuracy of palpation, but to also teach the ability to discriminate qualitative information. These palpation skills are like any other psychomotor manual skill: they need to be honed and practiced to be truly effective.

It is important to provide situations and activities that stimulate higher levels of thinking in our students. Athletic training educators should carefully select learning activities that integrate knowledge throughout the curriculum. These activities should be progressive and sequential, building upon each other to gradually increase demand and psychomotor skill within each student. This intentional scaffolding of activities will help students improve their technique and comprehension. Eberman and Finn[21] were the first to describe stereognosis drills as a means to improve palpation skills. Their article describes lessons to develop palpation skills while providing objectives for each activity, instructions to replicate each activity, and possible discussion questions for follow-up reflection with the student to provide feedback. The pattern of activities presented here is a 2-level progression that builds upon those presented by Eberman and Finn.[21]

INSTRUCTIONAL TECHINQUES

Coin Discrimination

The ability to discriminate small differences in tissue is important. Anecdotally, many novice clinicians have trouble interpreting information coming in through their fingers while palpating structures. The progression here strives to teach students the ability to receive information while controlling their force of palpation. Most students will typically perform these activities only with their dominant hand; however, it is important that students also practice with their nondominant hand to ensure development of the same stereognosis skills with their opposite hand. This will help improve the students' skill level with bimanual evaluation and intervention tasks.

Materials Needed.

- Standard US coins (quarter, dime, nickel, penny)
- Brown paper bag (recommended size: 1.81 kg [4 lb], 12.7 × 7.9 × 24.8 cm)
- Towel
- Examination gloves (optional)

Level 1.

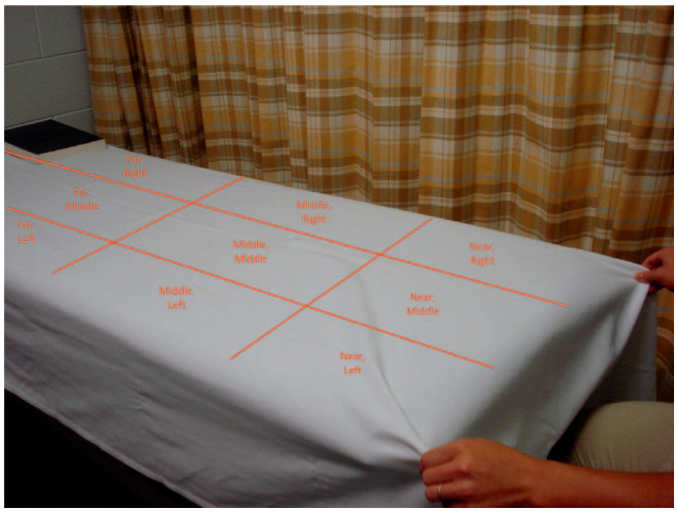
– Using standard coins (quarter, dime, nickel, and penny), inspect the size, structure, and features of each coin and the differences among them. How large is the coin? Are there ridges on the edge? Are there prominent engravings on it? Students should be encouraged to use their index and middle fingers to explore each coin (Figure 1).

– Place the coins into a paper bag. Without looking in the bag, try to feel the coins with your fingers and pull them out of the bag in size order from smallest to largest. Record the time it takes to complete the task to see progression of skill. Once students can perform this successfully 3 times in a row, allow them to proceed to the next level.

– Now place a full set (quarter, dime, nickel, penny) of coins back in the paper bag or under a towel (to hide the coins). Without looking at the coins feel for the heads or tails side of the coin as specified by a partner. Can students successfully set the coin down in front of them with the correct side up? Have the student continue to practice until he or she is able to do this 10 times in a row.

Figure 1. Light pressure is used in the index and middle fingers to teach surface discrimination skills with a set of coins.

Figure 2. The location of the book is determined with eyes closed by assessing tension while gently pulling the crimp from the sheet.



Level 2.

– Place 3 dimes into a paper bag with 100 pennies. Ask students to feel through the coins in the bag and pull the 3 dimes from the group of coins. Students can be timed while completing the task to see progression of skill.

– For increased difficulty, students can perform the same drills above while wearing latex examination gloves. The gloves will create a physical barrier to blunt the tactile stimuli of the coins and will require improved fine pressure discrimination in order to complete these tasks.

Sheet Tension

In additional to compression, palpation should also include the ability to detect tension and tissue crimp within muscle or connective tissue, as this is an important diagnostic tool in manual medicine techniques such as myofascial release, manual joint distraction, and muscle energy. This task teaches students the ability to discriminate various levels of tissue tension and crimp.

Materials Needed.

• Plinth treatment table

• Twin bedsheet

• Heavy textbook

• Light textbook or professional journal

Level 1.

– Lay the bedsheet on a plinth treatment table. The student should sit at the head of the table and close his or her eyes. A partner quietly places a heavy textbook in 1 of 9 possible spots (near, middle, far × left, center, right). The student should start the activity by holding the corners of the sheet between the thumb and fingers with both hands. Without lifting or sliding the sheet, gently pull the stretch (analogous to tissue crimp) out of the sheet to determine where the book is located (Figure 2). Each book location will place slightly different tension on the sheet; students will gradually discern the differences in feel.

Level 2.

– Once a student is able to correctly place the location of the book in 8 of 10 trials, replace the heavy book with a lighter textbook or professional journal. The decreased weight and resistance will make the task more difficult.

Vacuum Immobilizer Assembly

Many soft tissue mobilization techniques require clinicians to be skilled in soft tissue manipulation, and some require application of different forces though each hand, such as when one hand may need to provide a stabilization force while the other mobilizes tissue. For example, in some active or passive manual muscle-lengthening techniques, a clinician must be able to maintain pressure through a muscle or tendon as it is stretched and lengthened underneath the held pressure point. Additionally, deep palpation techniques used in some ischemic-compression muscle releases, such as for the iliopsoas, require the ability to push or move through connective tissue in order to access the muscle. This stereognosis drill works to develop this skill.

Materials Needed.

• Vacuum immobilizer splint bag

• Tennis or racquetball balls

• Plastic ice bags

Level 1.

– Take a vacuum splint bag and remove all contents except for 2 splints, air pump, and the connecting hose. Then zip the bag and have a partner mix the contents. The student

Figure 3. Students feel through the exterior of a vacuum-immobilizer bag in order to connect the pump to the splint. Fill the bag with additional items for increased difficulty.

Figure 4. Compression of the padding of a table simulates the soft tissue of the body. The scale measures the force needed to compress this during mobilization simulation.

should try to feel through the bag for the different shapes and textures to connect the pump to the splint and remove the air from one of the splints (Figure 3). Record the time it takes to complete this on successive trials to monitor progression.

Level 2.

– To increase difficulty, additional trials can include small items such as tennis or racquet balls, assorted rolls of tape, and ice bags mixed in the splint bag so there is a variety of textures and obstacles to maneuver around as the splint and pump are connected.

Spring Scale Compression

This drill is excellent for developing consistent and precise joint mobilization technique. When performing a joint mobilization, precise force generation and hand placement are important to help minimize risk of injury to the patient while maximizing therapeutic benefit. The ability to reliably produce force is important to meeting both of these objectives.

Materials Needed.

- Analog spring bathroom scale
- Plinth treatment table
- Open- or closed-cell foam padding (recommended size: 20.3 × 30.5 × 0.95-cm pad cut to cover the surface of the analog spring bathroom scale)

Level 1.

– Place the scale on a plinth table. The student should place a hand on the scale and compress until he or she has reached the *anatomic barrier*, where in a patient population the joint has been translated to its end-range accessory glide. In this drill the anatomic barrier is found when the compressive force the student applies compresses the padding of the plinth table until the scale is in contact with the wooden base of the table (Figure 4). The student should note the reading on the scale at this point. This should be repeated multiple times until the student is able to use the feel of the anatomic barrier to replicate the force reading on the scale instead of reading the pressure from the dial.

– With eyes closed, the student should try to replicate the force required to achieve the anatomic barrier. A partner can verify this by checking the reading of the bathroom scale. After successful completion of 8 of 10 trials finding the anatomic barrier and replicating the force ±5 lb (2.27 kg) students can move to the second phase of the drill.

– Typically, joint mobilizations applied clinically require an oscillation force. Have the student add and subtract 8 to 10 lb (3.63–4.54 kg) of force from the initial anatomic barrier force measurement and now oscillate between the two for a period of 30 seconds to practice grade III/IV joint mobilizations. Students should practice until they are able to stay within the established boundaries for the entire time period.

– In order to simulate lower-amplitude grade I/II joint mobilizations, have the student cut the anatomic barrier force in half and, similar to the above drill, subtract 5 to 8 lb (2.27–3.63 kg) of force to set the oscillation boundaries. Students will find this more challenging to perform without exceeding the established boundaries, but should continue to practice until they are able to maintain this oscillation for 30 seconds. Remember to have students practice this drill with both hands to develop dexterity and stereognosis bilaterally.

Level 2.

– To progress the difficulty of this activity, add open- or closed-cell foam padding to the top of the scale during the oscillation activities described above. With variation of the thickness and densities of the foam on the scale, the student will appreciate a more realistic and lifelike feel and simulate

application of a joint mobilization to different joints and in patients with different body compositions.

Changing the external environment surrounding the student or the position the training task above is performed in can increase the difficulty and provide for additional progression of each activity. For example, the addition of external distractors such as background music or conversation between student partners while the student performs the skill can simulate a busy clinical environment. Also, changing the task from sitting to standing (or vice versa) or changing the treatment plane from a horizontal to a vertical (or oblique-angle) orientation will challenge a student to perform a skill in an unfamiliar or uncomfortable position. This change in position may alter the student's ability to perform the skill with accuracy and will simulate different patient treatment positions required of an athletic training clinician.

CLINICAL ADVANTAGE

All athletic training academic programs teach identification of palpation landmarks, and both students and entry-level clinicians become at least minimally proficient in surface-anatomy palpation.

Athletic training programs are proficient in developing a clinician's ability to accurately palpate surface-anatomy landmarks. However, students and entry-level clinicians likely need additional practice to develop advanced palpation skills such as tissue discrimination and force application during joint mobilizations. When students are introduced to drills and activities to develop qualitative palpation skills, they should, with practice, become better clinicians prepared to administer advanced evaluation and treatment techniques.

It has been demonstrated that clinicians who practice palpation skills have improved accuracy, force development, and reliability.[11–20] The techniques presented here could be integrated throughout an academic program to teach tactile discrimination to students. The level I coin discrimination and sheet activities could be introduced to the curriculum through lab activities in a basic evaluation course, whereas level II activities can be carried into a clinical psychomotor skills class or advanced evaluation course. Once a student has mastery of these activities and has progressed to the intervention portion of the curriculum, the level I and II vacuum-immobilizer assembly and spring-scale compression activities might become appropriate to integrate and begin to progress.

Additionally, these techniques could be used by clinicians to further develop or refine palpation skills. Many experienced athletic trainers may not have been trained to appreciate the qualitative nature of palpation, and the addition of this skill may make them more effective and well-rounded clinicians. The research literature does not specifically address if or when palpation skills are lost. However, it seems reasonable to project that skill level may diminish over time if the skills are not practiced regularly. Regular integration of these drills could help maintain palpation skills at the highest possible levels.

CONCLUSIONS

A student's ability to palpate structures in the body, and, more importantly, to gain information from these structures, is critical for success in the evaluation and treatment of injuries and illnesses. Additionally, as athletic trainers continue to use manual medicine skills with increasing frequency, the ability to discriminate subtle differences in the soft tissue could mean the difference between a successful and an unsuccessful intervention. Given the importance of palpation skills and the demonstrated ability to improve these skills with practice, educational drills that incorporate stereognosis should be included in athletic training educational programs. The stereognosis drills and progressions described here may help give educators some tools to develop increased palpation skill, ability, and confidence in their students.

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