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Applied Anatomy in Music: Body Mapping for Trumpeters

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APPLIED ANATOMY IN MUSIC: BODY MAPPING FOR TRUMPETERS

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Abstract

Musicians must move in order to produce sound. The body is the vehicle for movement, therefore, understanding the body structure can provide more effortless and efficient music making. The conceptual creators of Body Mapping, Barbara and William Conable, define a body map as, “One’s self-representation in one’s own brain.” Body Mapping provides a relatively new somatic approach to musical pedagogy. A number of existing dissertations and articles discuss the specific application of Body Mapping to keyboard, voice and woodwind instruments. Currently, however, very few resources have integrated Body Mapping into brass pedagogy. With this document I intend to provide a resource for teachers and students that presents specific pedagogical lessons on Body Mapping for the trumpet player.

In pursuit of this goal I relied on both my education and professional experience with trumpet performance as well as my more recent and ongoing education in Body Mapping. I am currently enrolled in the Andover Educators Trainee Program. This program has provided me access to official Body Mapping materials including, illustrations, literature, and videos. These resources, in addition to two semesters of Body Mapping classes at the University of Nevada, Las Vegas (UNLV) with licensed Andover Educator, Dr. Stephen Caplan, have formed the basis of my research.

Sitting and standing, the arms, and mapping the trumpet (how sound production occurs) are the areas of primary focus. Sitting and Standing are two states of balance that trumpet players most often occupy. Correctly mapping these two states of balance enables muscular freedom and healthy performing habits. The arm structure is directly involved in holding and controlling the

trumpet. Correctly mapping the arms enables trumpeters to efficiently finger the valves and manage the slides. Free arms are crucial to healthy trumpet playing. Mapping the trumpet helps trumpeters to approach the instrument competently. Misunderstanding how the trumpet functions can quickly sabotage Body Mapping progress while correctly mapping the trumpet enhances and compliments Body Mapping work. I will incorporate visual representations and explain the structures in the focal areas, followed by exercises and practice techniques that enable players to integrate a newly informed body map. The result will be information that is approachable and applicable for any trumpet player.

A substantial omission in this document is a chapter addressing breathing. Breathing is of primary concern for all trumpet players and the structures, functions, and sizes of breathing anatomy should be carefully mapped. Breathing is omitted because there are some excellent Body Mapping resources for brass players regarding breathing and the addition of a breathing chapter would have been beyond the necessary scope of this paper.

Acknowledgments

I would like to thank Dr. Stephen Caplan for his expertise, guidance, and dedication to providing excellent feedback. I would also like to thank my parents, Daniel and Sylvia Holt for your love, support, and encouragement throughout this process.

Table of Contents

List of Figures

Introduction

During the past ten years of my life, I have been deeply involved in two very separate, yet complementary activities. Trumpet playing and rock climbing have sculpted who I am and have become integral parts of my life. Each activity requires intensive practice and discipline, both physically and mentally. In these fields, maximizing the knowledge we carry regarding our physical and mental selves yields more efficient practice and better overall performance. I have found that my physical and mental self-awareness as a trumpet player have been cultivated from my practice in rock climbing. With trumpet, I have developed musical skills, but, I have discovered that the physical and mental self-awareness cultivated from rock climbing has been equally important to my trumpet playing. The importance of achieving physical awareness while rock climbing is fairly explicit, if your arms and legs are not doing exactly what you want them to do, you will fall. Trumpet playing is similar, however, the relationship between the physical self and performance is more subtle, and often overlooked.

I became acutely aware of this issue when I took my first Body Mapping class with Dr. Stephen Caplan at the University of Nevada, Las Vegas (UNLV.) It should be noted that Barbara and William Conable, the conceptual creators of Body Mapping, define a body map as "One's self-representation in one's own brain."[1] Prior to taking this course I felt confident in my physical understanding of my body and how it related to playing the trumpet. My confidence was quickly replaced with an awareness of my general lack of knowledge and a frustration that this important material had never been mentioned to me before. After two semesters of Body

[1] Barbara Conable, *What Every Musician Needs to Know About the Body: The Practical Application of Body Mapping to Making Music* (Chicago: GIA Publications Inc., 2000) 5.

Mapping coursework, the effects of my refined self-representation are substantial. My technique, sound, endurance and range have all improved as a direct result of Body Mapping. More importantly, I now have a grounded understanding of my body and how my body functions while playing the trumpet. This understanding will enable me to continue to improve my own playing as well as enable me to be a more successful pedagogue.

Currently, there are relatively few somatic related resources for trumpet players. There are several possible explanations for this. First, trumpet players seem to be immobile. The only obvious motions that we make involve our fingers. This would lead most to believe that trumpet players do not use their bodies and therefore increasing any self-representation would have minimal impact. Second, there has traditionally been a somewhat generic problem solving process in the trumpet playing community. Practicing more, breathing better, and equipment changes are often suggested solutions for problems that occur as a result of a flawed body map. Because Body Mapping is a more recent branch of pedagogy, few teachers are equipped with Body Mapping knowledge to help address fundamental flaws which may result in technical difficulties at best and in the worst cases career ending injuries.

The root of the issue seems to be that few trumpet pedagogues are aware of Body Mapping and how it can benefit the trumpet player. In recent years I have attended multiple trumpet conferences and Body Mapping has never been mentioned. The Alexander Technique and Feldenkrais Method are two other branches of somatic pedagogy that are being slowly assimilated into the world of trumpet pedagogy. Body Mapping offers unique information that stands alone as well as supports these related somatic approaches. My goal with this document is to provide a resource for teachers and students that presents specific pedagogical lessons on

Body Mapping for the trumpet player. If there is Body Mapping information readily available to the trumpet playing community, teachers can easily integrate Body Mapping into their curriculum. There are Body Mapping dissertations and books dedicated to many other wind, string, and vocal music mediums. It is time for the trumpet world to reap the benefits of Body Mapping.

Relevance to Trumpet Performance

Body Mapping truly has the potential to improve trumpet pedagogy and performance at every level. By maximizing the body's mechanical advantage, one can maximize the ability to perform at peak efficiency. For trumpet players this means an effortless sound throughout the entire range of the instrument, excellent endurance, technique, and an injury free playing career. For pedagogues, this translates into healthier and more efficient students. In order to begin to take full advantage of our body's mechanisms we must have an accurate body map. Integrating Body Mapping into the trumpet curriculum will promote healthy playing habits in trumpet players as well as improve the general level of trumpet playing.

It is important to note that the health education of musicians is gaining momentum on the national scale. Two studies that highlight this trend have been published in the *Medical Problems of Performing Artists* Journal. The first study, "Medical Problems of Brass Instrumentalists: Prevalence Rates for Trumpet, Trombone, French Horn, and Low Brass."[2] investigates the prevalence of specific points of injury for each brass instrument. The results indicated that 61% of brass players have experienced at least one musculoskeletal injury. On average, 53% of

[2] Kris Chesky, Karendra Devroop, and James Ford, "Medical Problems of Brass Instrumentalists: Prevalence Rates for Trumpet, Trombone, French Horn, and Low Brass," *Medical Problems of Performing Artists* (June 2002): 93-98.

trumpet players experienced or were experiencing some form of musculoskeletal problem. The most common injuries were pain in the neck, low back, and wrist, with the majority of the pain coming from the right side of the body. This study clearly highlights the need for health education in America's schools of music. The second study was published in 2014. This study's purpose was, "to incorporate health education content into an undergraduate music education methods course."[3] This study concluded that current music educators lacked awareness of health related performance issues and that by embedding health education into the standard curriculum, schools of music can prevent performance related injury and also promote positive change in future musicians and educators. The next step is implementing health education into not only the general curriculum but also the applied studio. Body Mapping is a perfect solution for this problem as it provides a structured approach to understanding the body and allows students to incorporate their knowledge into healthy performance practice.

Body Mapping can begin at any level. Beginners and professionals both may experience immediate improvements in their trumpet playing. Ideally, the integration of Body Mapping would occur from the first day of playing throughout the player's entire career. Any improvement in the body map will have a positive impact on the trumpet player.

Review of Scholarly Research

The largest source of printed Body Mapping material for brass players comes from Mountain Peak Music based in Flagstaff, AZ. David Vining is the owner of Mountain Peak Music, a Body Mapping teacher, and trombone professor. His book, *What Every Trombonist*

[3] Amy Laursen and Kris Chesky, "Addressing the NASM Health and Safety Standard through Curricular Changes in a Brass Methods Course: An Outcome Study," *Medical Problems of Performing Artists* (September 2014): 137.

Needs to Know About the Body, is the most thorough piece of research available on Body Mapping for brass players. This book was written for trombone players but also provides information relevant to all brass players. Mountain Peak has also published a *Breathing Book for Trumpet* that delves into the structures of breathing and playing the trumpet. This highly informative book is a great resource for understanding the mechanisms of breathing and applying them to a trumpet routine.

Barbara Conable, a co-founder of Body Mapping, published the original Body Mapping book for musicians titled *What Every Musician Needs to Know About the Body*. She has also published more specific titles such as *The Structures and Movement of Breathing: A Primer for Choirs and Choruses*. Each of these books contain fundamental information on Body Mapping and how it can be applied as a musician.

Several Body Mapping related dissertations have also been published in the last 15 years, however, none of these dissertations have been written by a brass player. This is unfortunate given the amount of applicable information Body Mapping presents. It seems the pianists, vocalists, and woodwind players have been largely responsible for the academic work involving Body Mapping.

Generally, there is a large void in the field of Body Mapping for brass players. It seems brass pedagogues are generally behind in terms of integrating somatic related approaches into their curriculum. Although there are scattered pockets of pedagogues nationally who do integrate somatic teaching into their curriculum, they are by no means the majority. The unfortunate reality is that the trend does exist and is reflected by my personal experience. After attending two universities and attaining degrees from both, I had never heard of Body Mapping. Furthermore,

there is a large quantity of mis-information regarding the body in trumpet playing literature. When looking at breathing instructions from a variety of method books for trumpet it is hard to ignore lines such as, "Fill the lungs and diaphragm...grip the air by tensing the abdominal muscles,"[4] "To exhale, draw your stomach up and under your frontal rib cage,"[5] and "Pull the tongue back and allow air to penetrate the lungs. The stomach should not swell, but rather contract in proportion to which the chest expands. The air suddenly pushes its way into the instrument."[6] These statements all reflect a severe lack of anatomical understanding surrounding the most fundamental element of trumpet playing, the breath. Similar misinformation is present in regards to holding the instrument, as well as posture. These threads of misinformation hinder trumpet students' progress, and also may result in performance related injuries. Body Mapping presents a very direct and logical approach to somatic pedagogy. The information provided is rooted in anatomical fact and is relatively undisputable. It is my hope that by presenting clear research that can be easily applied in a trumpet curriculum that I can begin to fill the void of Body Mapping related information in the brass community and begin to correct generations of misinformation.

Methodology

Of primary importance is increasing my own general knowledge of Body Mapping pedagogy. I will approach this by taking lessons with Dr. Caplan and David Vining. I will also continue to pursue becoming a licensed Andover Educator by purchasing and studying official

[4] Bud Brisbois, *Trumpet Today: A Planned Program for Building the High Register* (Hollywood, CA: Highland Music Company, 1954), 3.
[5] Jerome Callet, *Superchops: The Virtuoso Embouchure Method for Trumpet and Brass* (New York: Jerome Callet, 1987),8.
[6] J.B. Arban, *Arban's Complete Conservatory Method for Trumpet* (New York: Carl Fischer, 1982), 8.

Body Mapping materials. As a trainee I will have access to official Body Mapping illustrations which I can include in my document and use to support my work. By taking these steps I will ensure the quality of the material I am presenting.

In this document, my goal is to present several pedagogical lessons on Body Mapping. These lessons should involve the areas of the body that trumpet players use in a unique manner as well as important broad ideas such as spinal alignment and the mechanisms of breathing.

Sitting and standing while playing the trumpet are important structural considerations I will address. Proper alignment of the spine and weight disbursement while sitting and standing is the result an accurate body map and healthy playing habits. Again, I will incorporate visual representations and explain the structures involved in sitting and standing, followed by exercises and practice techniques that enable players to integrate a newly informed body map.

The arm structure is another obvious choice. I would like to start by presenting visual representations of the anatomical structure of the arms. After explaining the general structures of the arm and their functions, I will go on to provide suggestions on how to most efficiently support the trumpet and dexterously finger the valves. Again, each body is different and players will need to use different techniques to maximize their efficiency. I hope to provide accommodating suggestions to all shapes and sizes as well as pictures to provide visual support to students and teachers. I would also like to suggest exercises or practice techniques that help the player to integrate the refined self-representation of their arm structure into their playing.

Finally, I will introduce information on how to correctly map sound production on the trumpet. While Body Mapping is crucial, correctly mapping sound production on the trumpet is also important. Mismapping the trumpet will have similar crippling results to mismapping the

body. Players who have mismapped the trumpet will often have a weak sound quality, lack endurance and flexibility, and feel unable to progress in their trumpet playing. By introducing how to correctly map sound production on the trumpet, students and pedagogues be able to clearly identify and correct typical trumpet problems.

Chapter 1

Sitting and Standing

Understanding the structures involved with sitting and standing, including their respective sizes and functions, is essential to the trumpet player. With few exceptions, the trumpet player will be sitting or standing while making music which makes accurately mapping these two states of balance critical. It is important to note that sitting and standing are not rigid states. Instead, they are states of balance in which the weight of the body can be supported by the head, spine, pelvis, and legs. The components of these structures all serve to bear and distribute the weight of the body and trumpet into the ground if standing, and into the chair when sitting. If the core structures of the body are properly mapped, the trumpet player will have a foundation for sitting and standing with maximum efficiency and ease.[7]

Spine

The spine is the principal weight bearing structure in our body and is located at the core of our skeletal structure.[8] It serves to balance and distribute the weight of the head and torso into the pelvis. Mismapping the spine is relatively commonplace. A typical mismapping of the spinal structure maps the spine as straight rather than curved. This mismapping causes muscles throughout the upper body to hold the spine in a straight and rigid position. Undue muscular engagement restricts airflow causing problems in all aspects of trumpet playing.

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[7] Barbara Conable, *What Every Musician Needs to Know About the Body: The Practical Application of Body Mapping to Making Music (Chicago: Andover Press, 2000), 5.*

[8] Conable, *What Every Musician Needs to Know About the Body,* 12.

Musicians also frequently mismap the spine, believing it to be more narrow than it actually is. Players succumbing to this mismapping will struggle to rely on the thick stable discs in the lumbar spine to support their weight and instead rely on their muscles. Misuse of the muscles restricts airflow and hinders trumpet playing.

There are many other common mismappings of the spine and trying to identify them all is impossible, however, identifying common symptoms of spinal mismappings is useful. Symptoms to watch for are: the head being pulled too far back or forward, weight being distributed into the heels, locked knees, and general body stiffness. These symptoms all point to the misuse of muscles in order to accommodate the mismapped spine. A primary purpose of the spine is to balance and distribute the weight of the head, neck, and torso without the assistance (misuse) of muscles. Muscular engagement restricts breathing and results in tension. Sluggish articulation, a stuffy sound, inability to play in the outer registers, lack of flexibility, and endurance issues are common musical results of spinal mismapping.

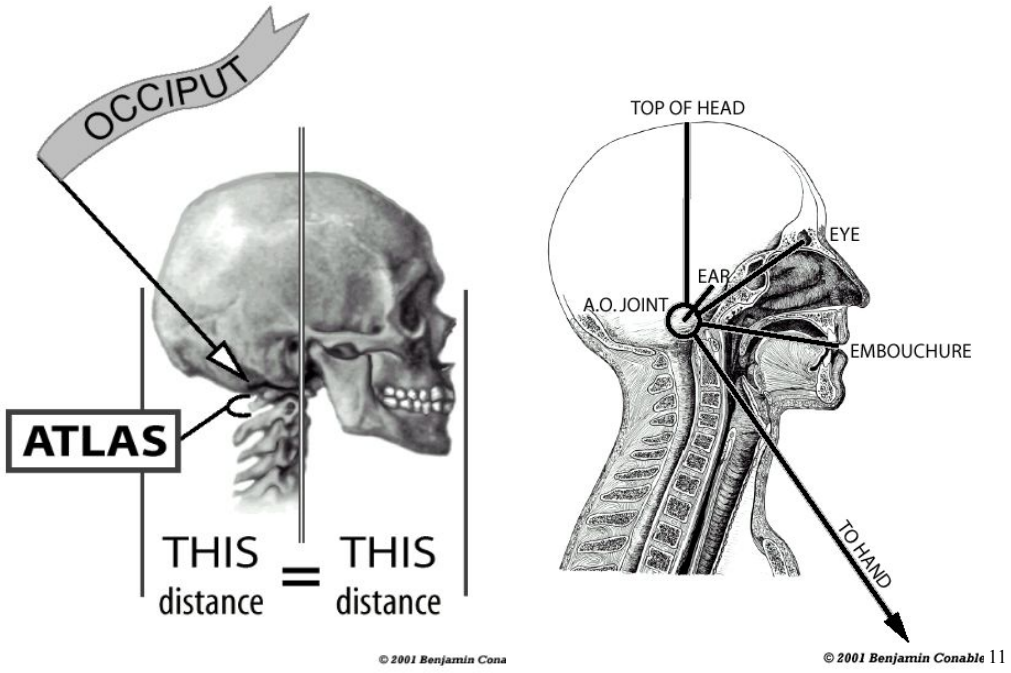
Developing a clear conception of the AO Joint, Vertebrae and Discs, and the General Structure of the spine are all essential for an accurate body map. Images and explanations are provided to develop and refine the trumpeter's body map.

The AO Joint

The AO (Atlanto-Occipital) joint is located at the top of the spine. The head is balanced atop the spine at the AO joint. The Atlas is the top vertebra of the spine and is structured to balance the head. The Occiput is the base of the skull, which is designed to fit and balance atop

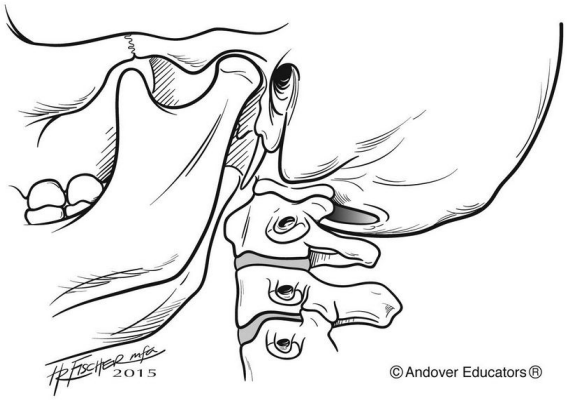
the Atlas.[9] The AO joint is incredibly important due to the weight of the head, which generally weighs between 8 and 12 pounds, similar to a bowling ball.[10] If the weight of the head is imbalanced, the muscles of the neck will engage, wasting energy and causing tension. If the weight of the head is balanced on the AO joint, however, the trumpet player can have a free neck and will be able to move freely in practice and performance.

Figure 1: The AO Joint



11

[9] Conable, *What Every Musician Needs to Know About the Body,* 6.
[10] David Vining, *What Every Trombonist Needs to Know About the Body* (Flagstaff, AZ: Mountain Peak Music, 2010), 30.
[11] Benjamin Conable, "Benjamin Conable Images," Andover Educators, *http://www.andovereducators.wildapricot.org/page-1704501* (accessed March 17, 2016).



[12]

Movement Activity

The images above show where the AO joint is located. Incorporating the visual information about the AO joint into your own body map is an important next step. An easy way to develop a kinesthetic awareness of the AO joint is by pointing between both ears and subtly nodding the head. These subtle movements occur at the AO joint and are a good way to increase your kinesthetic awareness.

Correctly mapping the AO joint enables the trumpet player to balance the weight of the head on the spine rather than actively support the weight of the head with the neck and back muscles. It is important to understand that balancing the head is dynamic rather than static. To best prove this point try moving like a bobblehead while playing. If the head can move easily at the AO joint while playing, chances are it is properly balanced as the muscles in the neck are not engaging to compensate for the weight of the head. If the head is not balanced while sitting or standing, muscles throughout the body will engage in order to cope with the weight of the head.

[12] Holly Fischer, "Holly Fischer Images," Andover Educators, *http://www.andovereducators.wildapricot.org/Holly-Fischer-Images* (accessed March 17, 2016).

Properly mapping the AO joint and balancing the head is the first step towards sitting and standing efficiently.

Vertebrae and Discs

Beneath the Atlas follows the rest of the spine. In order to understand the structure of the whole spine, it is important to first understand the structure of its building blocks: the vertebrae and the discs. Each vertebra is bone and consists of a thick round weight bearing section in the front and a thinner back section which serves to protect the spinal cord.[13] The discs are soft and filled with fluid yet extremely resilient. Discs enable the spine to move and absorb shock while protecting the vertebrae. The discs are located between the bodies of the vertebrae in the front, not the thinner back section. If the weight is distributed onto the thin back section of the spine, pressure will be applied to the spinal column.[14] This places undue tension on the nervous system which your body will compensate for by engaging supportive musculature.

[13] Conable, *What Every Musician Needs to Know About the Body,* 12.
[14] Ibid., 13.

Figure 2: Vertebra and Discs

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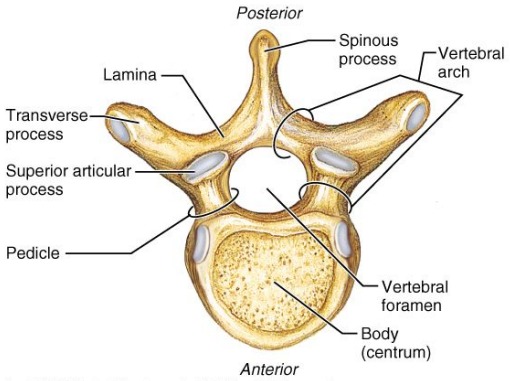


16

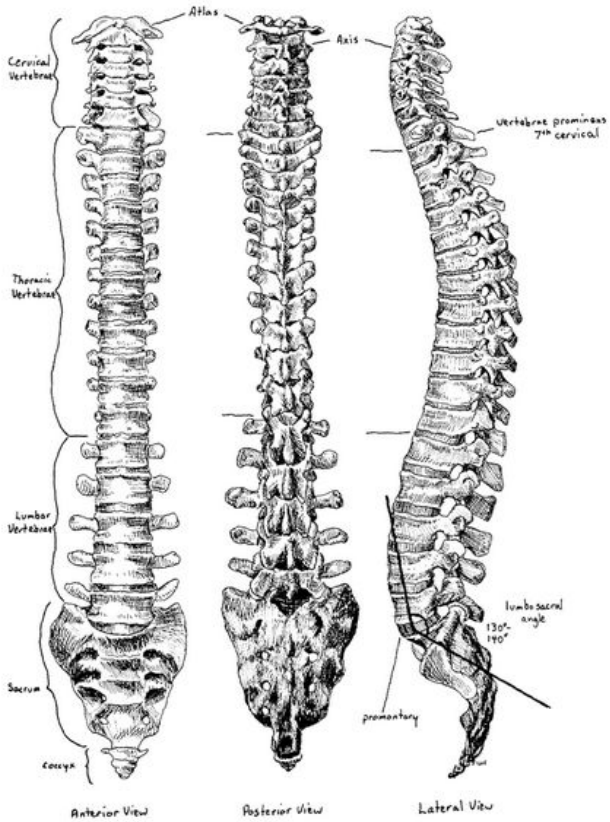
General Structure

Now that the vertebrae and discs have been mapped, the general structure of the spine can be addressed. The spine is commonly divided into three sections, the cervical, thoracic, and lumbar regions, as shown in the diagram below. The cervical spine consists of the 7 top most vertebrae, the middle thoracic region contains 12 vertebrae, and the 5 lumbar vertebrae make up the lowest region of the spine.[17] The vertebrae increase in size depending on the amount of weight they must bear. The cervical vertebrae are the smallest because they bear the weight of the head and neck while the lumbar vertebrae are the largest as they bear the weight of the head,

[15] Benjamin Conable, "Benjamin Conable Images," Andover Educators, *http://www.andovereducators.wildapricot.org/page-1704501* (accessed March 17, 2016).
[16] Benjamin Cummings, "Exam 2 Review, Vertebra Images," James F. Thompson, *http://www.apsubiology.org/anatomy/2010/2010_Exam_Reviews/Exam_2_Review/Ch_7_Axial_Skeleton.htm* (accessed March 17, 2016).
[17] Vining, *What Every Trombonist Needs to Know About the Body,* 20.

neck, and torso. Understanding that the spine becomes larger further down the body enables the trumpet player to conceptually begin to trust his or her weight bearing system.

Figure 3: The Spine



[18]

The spine has 4 curves. The cervical, thoracic, lumbar, and sacral curves.[19] These curves help the spine to accommodate its wide range of flexibility, durability, and strength. While most

[18] David Gorman, "Gorman Images," Andover Educators, *http://www.andovereducators.wildapricot.org/page-1704533/12503376* (accessed March 17, 2016).
[19] Stephen Caplan, *Oboemotions: What Every Oboe Player Needs to Know About the Body* (Chicago: GIA Publications, Inc., 2009), 21.

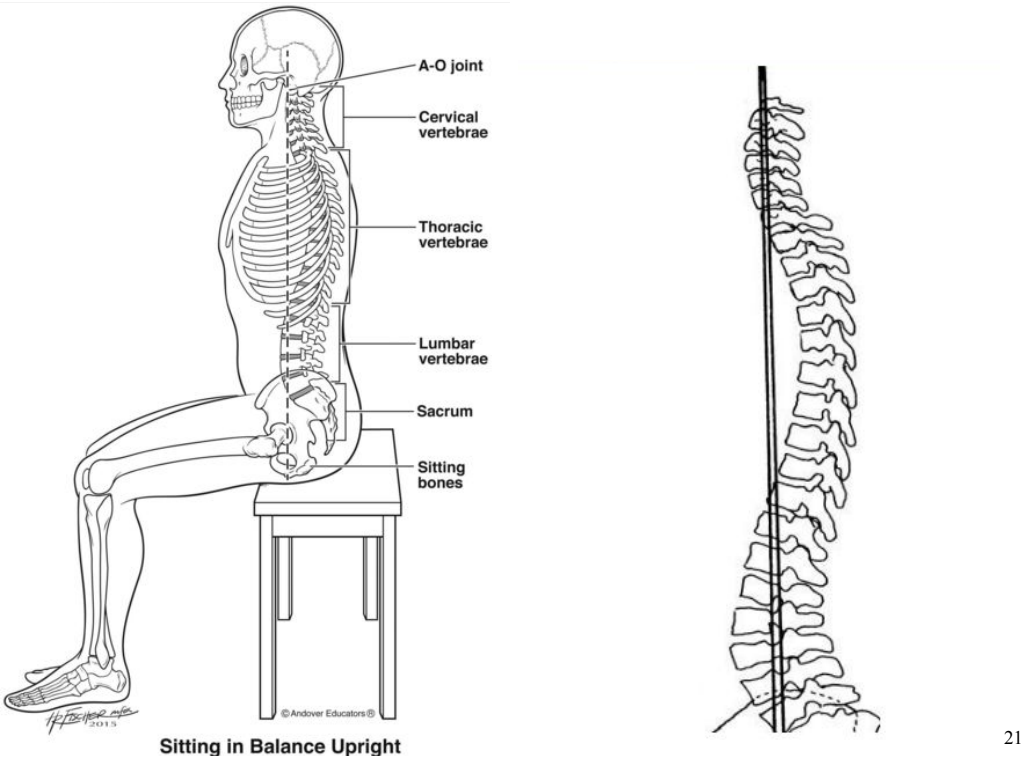
people understand that their spine is curved, many have not taken the time to integrate this information into their body map.

One common mismapping of the spine is its general shape. Most trumpeters have heard phrases such as, “Keep your back straight,” “Stand up straight,” or “Sit up straight.” All of these phrases suggest that the spine is straight, which is untrue. The spine is a curvaceous structure. Although many trumpeters may “know” that the spine is curved, it is probable that they have not taken the time to integrate this knowledge into their body map and are maintaining poor physical habits as a result.

A concept that makes a dramatic improvement in correct spinal mapping is aligning the AO joint over the lumbar core of the spine. This alignment allows the weight of the head to be distributed into the thick lumbar vertebrae. When the AO joint and lumbar vertebrae are aligned, the lumbar vertebrae can serve as a counter-balance to the AO joint.[20] This counter-balance grants extra stability and support at the AO joint. The images below show correct alignment of the AO joint over the lumbar core.

[20] Caplan, *Oboemotions,* 21-23.

Figure 4: Aligning the Spine



[21]

Trumpeters who sit up straight in what one may perceive as a rigid military position likely are aligning their AO joint over their thoracic vertebrae. This misalignment can cause lower back pain and general body tension. To correct this problem, the trumpet player needs to shift their weight forward so the weight of the head is balanced over the lumbar spine. When the AO joint and lumbar spine are balanced, the muscles through the torso and neck can be free to accommodate efficient trumpet playing.

The picture below and left demonstrates a rigid position. Notice the tension throughout the neck and how far back the upper body is positioned. The picture below and right

[21] Holly Fischer, "Holly Fischer Images," Andover Educators, *http://www.andovereducators.wildapricot.org/Holly-Fischer-Images* (accessed March 17, 2016).

demonstrates a correct sitting position. The neck is free and the AO joint balanced over the lumbar spine.

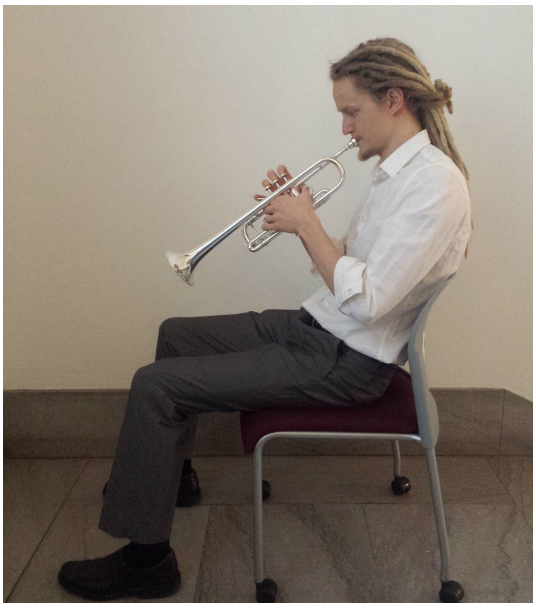
Figure 5: Sitting In and Out of Balance

The sitting position opposite the rigid military position is the slumped position. This sitting position can develop in numerous ways. In many instances, students grow tired of holding themselves up in the military position and resign to slumping into their chair. There are also several rather famous pictures of trumpet icons such as Miles Davis and Chet Baker playing in a slumped position which could lead students to believe this could be beneficial. Regardless, sitting in the slumped position is not the path to good trumpet playing. In the slumped position,

the supportive curves of the spine are abandoned and compressed forward. The weight of the torso is thrown into the back of the chair and into the seat of the chair through the thighs and sacrum. Compressing the spine forward in this way will restrict freedom of the breath by restricting the movement of the lungs. The necks cervical curve will also be compressed forward. When the neck collapses forward, the trachea will be compressed restricting the airway. Often, trumpet players resorting to sitting this way are looking for a position that feels easy. By presenting them the alternative of sitting in balance, they will see that sitting correctly and playing the trumpet can be more effortless than they originally thought.

The picture below demonstrates a slumped position. Notice that the weight of the torso is being distributed into the thighs and sacrum, rather than balanced on the sit bones. The natural supportive structure of the spine has been abandoned and is compressed inward.

Figure 6: Slumped Sitting



Aligning the AO joint over the lumbar core allows the weight of the torso and head to be naturally balanced. In order to fully understand this concept it is crucial that the trumpet player kinesthetically connect with the lumbar core.

Movement Activity

Feel the bottom of the ribs. Feel the top of the pelvis (iliac crest.) The lumbar core resides in between these two anatomical markers at the center of the body. Now that an awareness of the lumbar core has been created, using the kinesthetic sense, try to position the AO joint directly over the lumbar core. If proper alignment is achieved, there should be little to no muscular tension throughout the neck and torso.

Another common mismapping occurs when trumpeters map their necks as straight. Mismapping the neck in this way causes trumpeters to pull the head back and drop the chin to try and straighten the neck. A straight neck will have unnecessary muscular engagement and tension. This tension will inhibit the airflow through the throat and result in tense sound and sluggish articulation. To fix this mismapping the spine must be correctly mapped to include the cervical curve and a connection must be formed with the AO joint.

Movement Activity

Gently roll the head in several clockwise and several counter-clockwise circles. After rolling the head, balance the head on top of the spine. Try to kinesthetically feel the AO joint. Make micro-adjustments to the head via the AO joint. When balance is achieved the muscles in

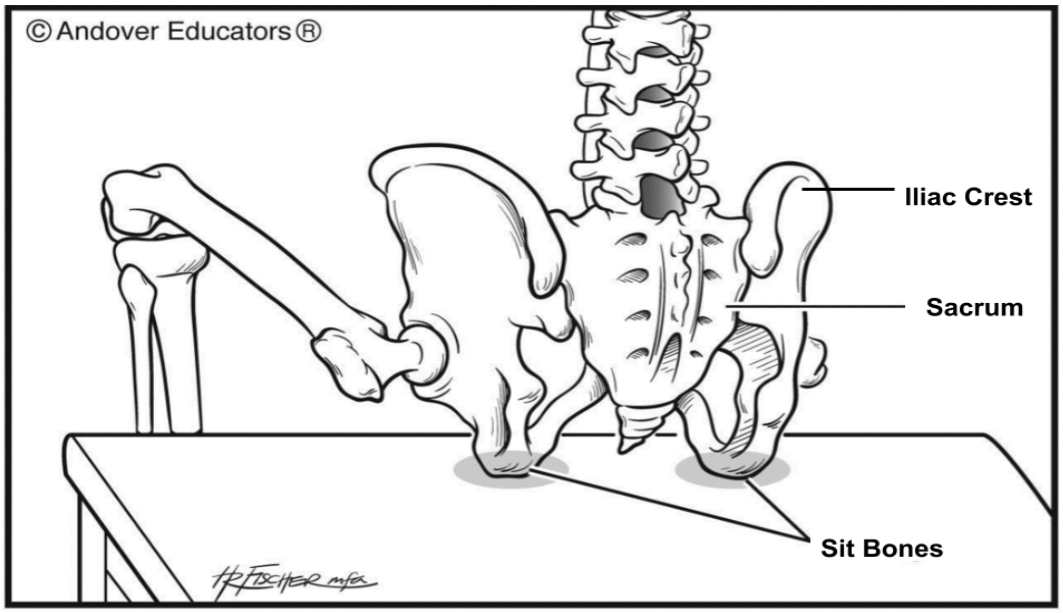
the neck will be free of tension. Kinesthetically feel the cervical curve of the spine in the neck. Notice how this curve draws up to the AO joint and supports the weight of the head. This is the balance, freedom, and awareness the trumpeter should strive to achieve while practicing and performing.

Pelvis

The pelvis is an important bone structure with many functions. At the bottom of the pelvis are the rockers which aid in sitting.[22] The sacrum is at the back of the pelvis and connects the pelvis to the spine. At the sides of the pelvis are sockets for the hip joints. The hip joints are ball and socket joints and enable a wide range of motion in the legs. When sitting and standing, the pelvis aids in creating an archlike structure which helps distribute weight into the chair or floor.[23] If properly mapped, the pelvis will distribute the weight of the torso and head into the legs or chair while maintaining balance and muscular freedom. Common mismappings of the pelvis include misplacement of the hip joints and an extra joint at the "waist." Correctly mapping the structures of the pelvis will enable the trumpeter to achieve efficient weight distribution and muscular freedom during practice and performance.

[22] Conable, *What Every Musician Needs to Know About the Body, 24.*
[23] Ibid., 27.

Figure 7: The Pelvis



[24]

Ilium

The Ilium is a large bone shaped like an elephant ear. The pelvis contains two ilium, one on each side of the sacrum.[25] On top of the ilium is a structure called the iliac crest which can be easily palpated on the outside of the hips near the beltline. The ilium acts as a connection point for muscles in the torso and hips. Mismapping the ilium as the hip joint is a common mismapping. Mismapping the legs extending to the the iliac crest leads to trumpeters attempting to bend at the iliac crest instead of the hip joints. Stress on the spine, poor movement, and tense breathing are results of this mismapping.

[24] Holly Fischer, "Holly Fischer Images," Andover Educators, *http://www.andovereducators.wildapricot.org/Holly-Fischer-Images* (accessed March 17, 2016).
[25] Conable, *What Every Musician Needs to Know About the Body,* 24.

Sacrum

The sacrum is the structure that connects the spine and the pelvis. It is considered both the base of the spine and part of the pelvis.[26] Because of this, weight borne by the spine is delivered through the pelvis either to the floor when standing or a chair when sitting.

Sit bones (Rockers)

The sit bones are located at the bottom of the pelvis.[27] These relatively round bones are the bones you may feel when you are sitting and serve to distribute your weight into your chair. When properly aligned, the sit bones should be in the same vertical plane as the lumbar core and the AO joint.[28] This alignment makes the distribution of weight through the skeleton possible. When the weight of the body is distributed through the AO joint, lumbar core, and sit bones, trumpeters will be balanced and find muscular freedom.

Trumpet players have often not taken time to correctly map their sitting structures. They believe they are supposed to be sitting on their thighs or delivering their weight through their tailbones. By understanding that the sit bones are designed to distribute the weight of the body into the chair, the trumpeter is able to release the weight of the body in a balanced and effortless manner. Feeling the connection of the sit bones and chair is important when sitting. Awareness of this connection makes it easy to release the weight of the body into the chair.

[26] Caplan, *Oboemotions,* 23.
[27] Conable, *What Every Musician Needs to Know About the Body,* 24.
[28] Ibid., 20.

Hip Joints

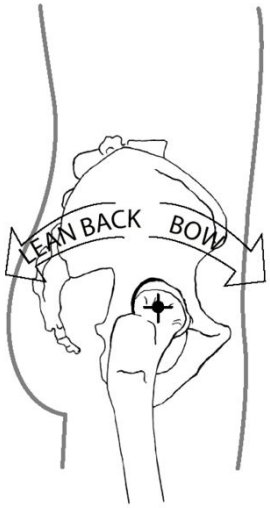
The hip joint is a large ball and socket joint that connects the pelvis to the femur (the large bone in the upper leg.)[29] The ball and socket joint allows for the wide range of motion available to the legs. In the image above, notice that the hip joint is located a few inches inside the outer edge of the femur. The top and outer section of the femur can be easily palpated and can help the trumpeter understand where the hip joint is located.

The Waist Problem

The waist is a common term referring to the mid-section of the body. Unfortunately, there is no anatomical structure associated with the waist. Many trumpeters have mapped a non-existent piece of anatomy to represent the waist. Usually, this imaginary anatomical feature is a waist joint from which one can bend. Bending from the waist while bowing, performing, or getting in and out of a chair will put stress on the spine and may lead to injury. To correct this mismapping the trumpeter must understand that the hip joints are the true midpoint of the body, and therefore, enable the pivoting of the torso. In the image below the hip joints are mapped and marked with a +.

[29] Ibid., 28

Figure 8: Bending at the Hip Joints



[30]

Removing the waist from the body map will allow for an accurate understanding of how the torso truly pivots on the hip joints.

Sitting

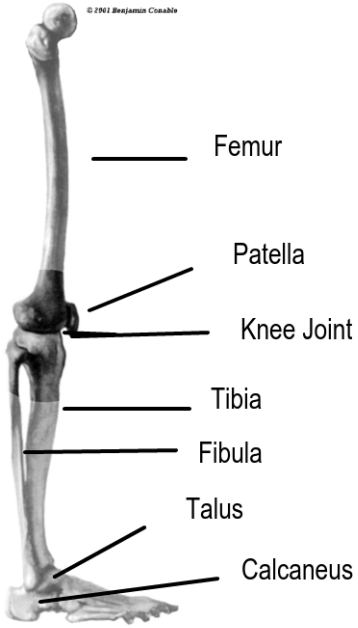
Phrases such as "relax into your chair" perpetuate problems with sitting and playing the trumpet. Often times, relaxing will cause a trumpeter to slouch into a chair rather than remain balanced and buoyant. When slouching into a chair, the weight of the body is distributed onto the tail bone instead of the sit bones. Slouching causes the spine to collapse slightly forward which inhibits breathing. Sitting in a relaxed manner does not lead to sitting in a manner conducive to trumpet playing. Sitting should be conceptualized as balanced and buoyant rather than relaxed.

[30] Benjamin Conable, "Benjamin Conable Images," Andover Educators, *http://www.andovereducators.wildapricot.org/page-1704501* (accessed March 17, 2016).

The Legs

The legs make up the lower half of the body. The legs serve to balance the upper body as well as transfer the weight of the body into the ground when standing. The hip joints, knees, and ankles are the six most important points of balance in the legs. When properly mapped, the bones and joints of the legs will freely balance the upper body and effortlessly transfer the weight of the whole body into the ground.

Figure 9: The Legs



[31]

Knees

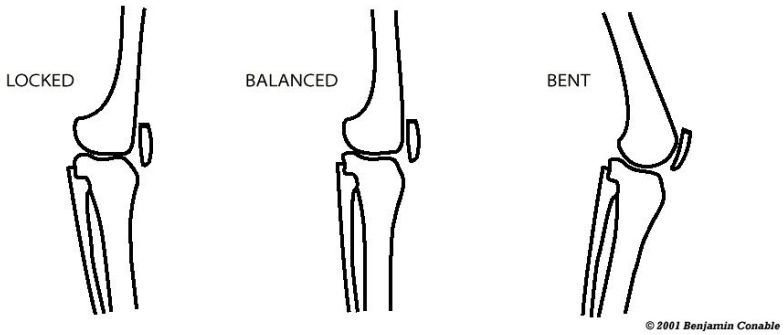
The knee is a hinge joint where the femur, the large bone in the upper leg, and the tibia, the large bone in the lower leg, meet.[32] The front of the knee joint is protected by a bone called

[31] Benjamin Conable, "Benjamin Conable Images," Andover Educators, *http://www.andovereducators.wildapricot.org/page-1704501* (accessed March 17, 2016).
[32] Conable, *What Every Musician Needs to Know About the Body,* 30

the patella or knee cap. A common mismapping places the knee joint directly behind the middle of the patella when the knee joint is actually just below the patella.

The knee joint has three states of alignment. The knee can be locked, balanced, or bent as shown below.[33]

Figure 10: States of the Knee



[34]

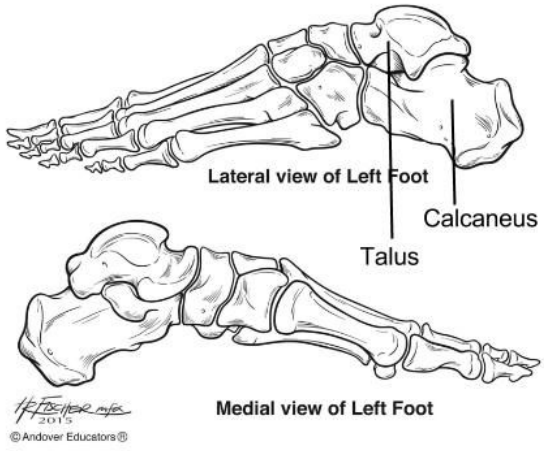
When standing it is best to keep the knees in balanced states as much as possible. Balanced knees result in free leg muscles and help to keep the body in balance. Locking the knees immediately brings tension into the legs and lower back, often resulting in other tensions throughout the body. Bending the knees engages the leg muscles, however, it is possible to bend the knees and maintain muscular freedom and balance above the hip joints. As long as the body above the hip joints remains free and balanced, bending the knees occasionally will not be detrimental to the trumpeter. Keeping the knees in a constant bend will eventually tire the legs

[33] Conable, *What Every Musician Needs to Know About the Body,* 31.
[34] Benjamin Conable, "Benjamin Conable Images," Andover Educators, *http://www.andovereducators.wildapricot.org/page-1704501* (accessed March 17, 2016).

and cause unnecessary muscular tension. It is best to strive for balanced knees whenever standing and playing the trumpet.

Ankles

Figure 11: The Ankle and Foot



[35]

The ankle joints act primarily as a hinge joints but also allow for secondary ranges of motion. The ankle is a connecting point for the tibia, fibula, and talus.[36] The talus is a bone located just below the tibia. The talus occupies a central location in the foot. It connects to two other foot bones, the calcaneus and the navicular. The calcaneus is the large bone that extends into the heel. The navicular is a smaller bone in the midfoot. Together, the bones of the foot form an arch structure.[37] The talus is the point at which the weight of the body is transferred onto the arch. The talus is often referred to as the keystone of the foot arch.

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[35] Holly Fischer, "Holly Fischer Images," Andover Educators, *http://www.andovereducators.wildapricot.org/Holly-Fischer-Images* (accessed March 17, 2016).
[36] Conable, *What Every Musician Needs to Know About the Body,* 32.
[37] Vining, *What Every Trombonist Needs to Know About the Body,* 109.

A common mismapping of the ankle is mapping the joint directly above the heel. This mismapping causes the trumpeter to distribute the weight of the body into the heel rather than the arch of the foot. Distributing the weight of the body into the heel often cause the knees to lock and the body to become tense. In the image below, the correct transfer of weight into the foot is illustrated.

Figure 12: Weight Distribution Into the Foot

[38]

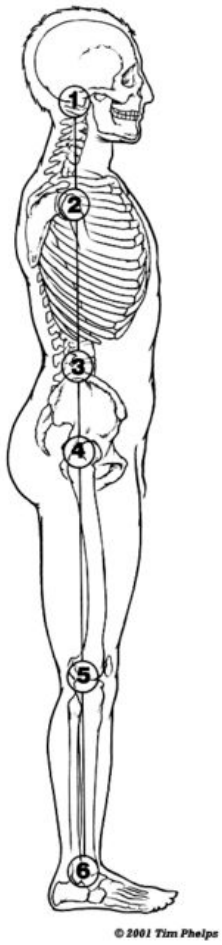
The arches of the feet are meant to easily distribute the weight of the body into the ground. Correctly mapping the ankle joints enables the trumpeter to direct the weight of the body into the middle of the arch where there is naturally the most support.

[38] Benjamin Conable, "Benjamin Conable Images," Andover Educators, *http://www.andovereducators.wildapricot.org/page-1704501* (accessed March 17, 2016).

Places of Balance

Now that the major structures involved in sitting and standing have been addressed, it is important to take into consideration the places of balance. Places of balance are physical structures that, if aligned, enable a balanced and free body. The six places of balance are the AO joint, upper arm structure, the lumbar spine, hip joint, knees, and ankles. Below is a diagram illustrating the six places of balance.[39]

Figure 13: Places of Balance



[40]

[39] Vining, *What Every Trombonist Knows About the Body,* 26.
[40] Tim Phelps, "Tim Phelps Images," Andover Educators, *http://www.andovereducators.wildapricot.org/page-1707116* (accessed March 23, 2016.)

Movement Activity

Stand with your arms at your sides. Kinesthetically become aware of the points shown above. Try to kinesthetically align the points of balance starting at the AO joint and working your way down. Remember, balance is buoyant and fluid, not static. Notice the freedom present throughout the body. Next, try to kinesthetically align the points of balance starting with the Ankle joints and working up the body. Does this feel different than aligning from the top down? Try to develop your kinesthetic awareness of these points while playing the trumpet.

By practicing the *Movement Activity* above, the trumpeter will develop a higher kinesthetic awareness. This will enable the trumpeter to strengthen his or her body map and continuously find balance and buoyancy while playing the trumpet.

While sitting, the places of balance remain the same as when standing. The difference is that instead of aligning over the ankle joints and connecting with the feet, the trumpeter must balance over the hip joints and connect with the sit bones. The legs still help to balance the body and should remain free.

Correctly mapping the head, spine, pelvis, and legs, gives the trumpeter a foundation and means to find balance and muscular freedom during practice and performance. The balance and muscular freedom gained by correctly mapping these structures, in turn, enables the trumpet player to approach the instrument with efficiency and ease. Approaching the trumpet in this way leads to better trumpet technique and sound as well as prevent injury.

Chapter 2

The Arms

Understanding the structures involved with the arms, including their respective sizes and functions, is important to the trumpet player. The arms are used to hold the trumpet and finger the valves. The arms are always involved in playing the trumpet. Unfortunately, the arms are generally misunderstood or neglected in trumpet pedagogy. The results of this pedagogical void become apparent when surveying a study from the University of North Texas. The study found that 14% of trumpet players had problems in their right arms and over 9% had problems with their left arms.[41] Better understanding the arms will not only improve practice and performance in trumpet players but also aid injury prevention and misuse. In the following chapter, the arms are mapped and common mismappings of the arms are addressed.

Upper Arms

The region of the upper arms consist of the scapula, humerus, clavicle and their respective joints.

The Shoulder Problem

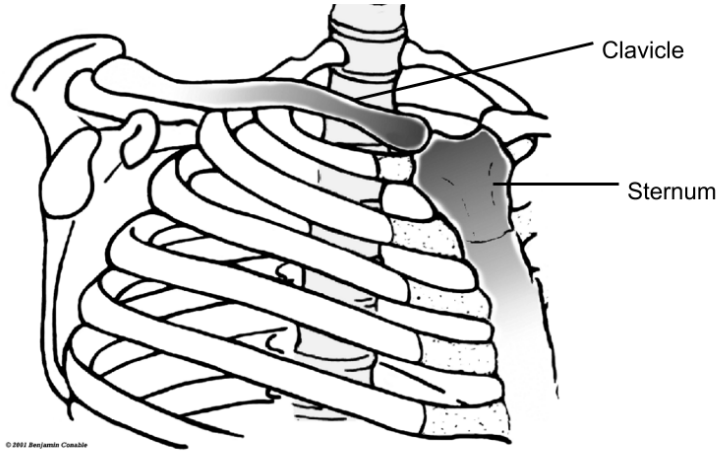
A problem with the scapula, humerus, clavicle and their respective joints is that the term trumpeters often use to refer to this area is 'shoulder.' Using a single umbrella term to refer to

[41] Chesky, Kris, Karendra Devroop, and James Ford. 2002. Medical Problems of Brass Instrumentalists: Prevalence Rates for Trumpet, Trombone, French Horn, and Low Brass. *Medical Problems of Performing Artists 17,* no. 4: 93-98.

three different bones and multiple joints all working to enable separate movements prohibits an accurate body map. When referring to the 'shoulders' the correct anatomical terms should be used so that trumpeters will have a clear map of the scapula, humerus, clavicle, and their respective joints. A body map including an exact arm structure will prevent injury and promote healthy and efficient trumpet playing.

Clavicle

Figure 14: The Sternoclavicular Joints



42

The arms begin at the clavicles, also referred to as collarbones. Each clavicle connects to the sternum at the sternoclavicular joint (SC joint.)[43] These are the *only points* at which the arms connect to the central skeletal core. Trumpet players use the SC joint when picking up, holding, and putting down the trumpet. Without the SC joint and collarbone included in the body map,

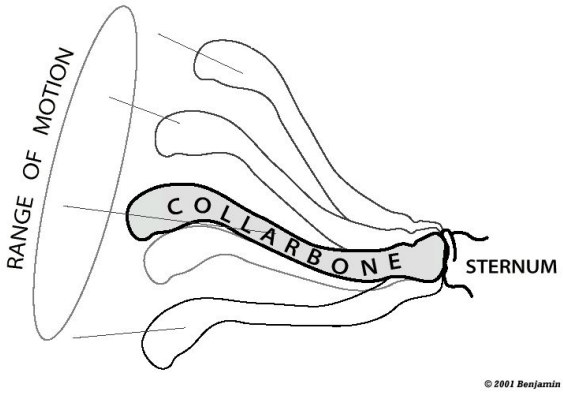
[42] Benjamin Conable, "Benjamin Conable Images," Andover Educators, *http://www.andovereducators.wildapricot.org/page-1704501* (accessed March 17, 2016).
[43] Conable, *What Every Musician Needs to Know About the Body,* 52.

the trumpet player may unnecessarily rely on the back and arm muscles to maneuver and support the instrument. If the trumpet player is using these muscles to hold the instrument, tension will build throughout the arms, neck and back. This will result in unnecessary mouthpiece pressure and tightness throughout the upper arms. In turn, the tightness will inhibit the breathing mechanisms and result in a constricted sound. If the SC joint and collarbone are included in the body map, the arm muscles will not over engage and are free to move and hold the trumpet with little to no effort. Freedom in the upper arms allows an unrestricted airflow and results in an effortless sound.

Movement Activity

Locating the SC joint is fairly simple. First, locate the collarbone on the front of the body. Follow this bone towards the sternum until a round bump is encountered near the center of the body. This bump is the end of the collarbone and the SC joint is found inwards of this bump. Experiment with moving the upper arm forwards, backwards, up and down (as shown below) while feeling the SC joint. The movement of the joint should be obvious.

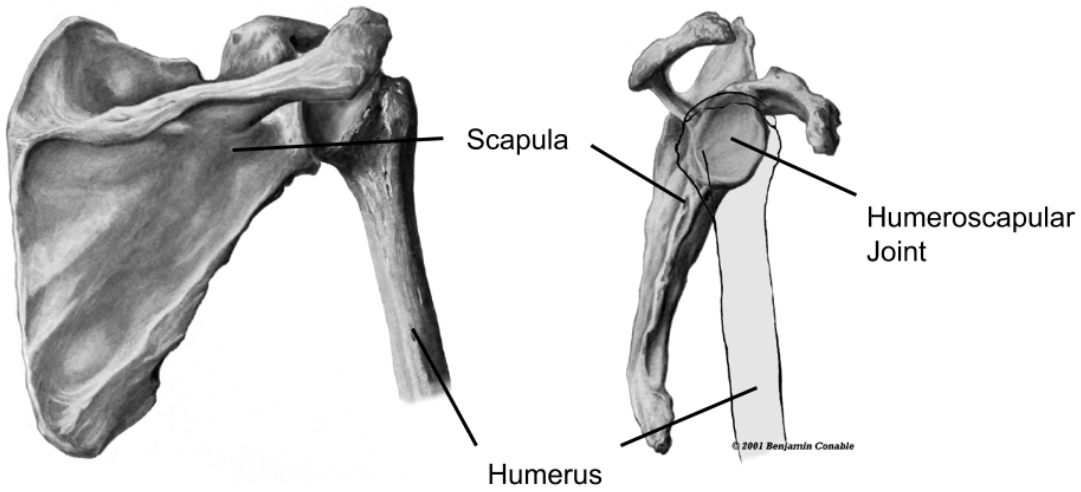
Figure 15: The Collarbone



[44]

Scapula and Humerus

Figure 16: The Scapula and Humerus



[45]

[44] Benjamin Conable, "Benjamin Conable Images," Andover Educators, *http://www.andovereducators.wildapricot.org/page-1704501* (accessed March 17, 2016).
[45] Benjamin Conable, "Benjamin Conable Images," Andover Educators, *http://www.andovereducators.wildapricot.org/page-1704501* (accessed March 17, 2016).

The scapula, or shoulder blade, is connected to the arm structure at two points. The scapula connects to the humerus at the humeroscapular (HS) joint and the clavicle at the acromioclavicular joint.[46] The humerus is the bone above the elbow in the upper arm. The HS joint is a ball and socket joint and naturally allows for a wide range of motion. The socket located on the scapula is small, around the size of a thumb print, while the ball on the top of the humerus is large.[47] This disproportionate size relationship enables the wide range of motion available to the upper arms.

The scapula does not connect directly to the ribs as one may suspect. Instead, it balances over the ribs and is attached within a network of fascia and muscles which allow for mobility.[48] Often times, connectivity within the upper arm region is misunderstood. Mismapping the upper arms and believing the scapula or humerus attach to the ribs has consequences. This mismapping causes the arm structure to lift with the ribs while inhaling, resulting in muscular tension. This mismapping also gives the trumpeter the impression that the upper arms are less mobile and free than they really are. Understanding the full mobility of the scapula will aid in mute changes and holding the trumpet.

Movement Activity

Take a moment to gently windmill the arms. Notice the wide range of motion allowed by the HS joint. Also notice that the scapula moves in rhythm with the humerus. Next rotate the clavicle, scapula and humerus around in one arm and feel the scapula with the opposite arm.

[46] Conable, *What Every Musician Needs to Know About the Body,* 55.
[47] Vining, *What Every Trombonist Needs to Know About the Body,* 83.
[48] Conable, *What Every Musician Needs to Know About the Body,* 54.

Notice that the scapula seems to float on the back. Remember the freedom of the arms when playing the trumpet.

Suspension

It is important to understand that the arm structure is suspended rather than held in place. Andover Educators relate the suspension of the arms to that of a suspension bridge.[49] On a bridge, cables of varying lengths run down from the pillars to suspend the deck. The arms have muscles, tendons, and other fascia that act as cables and the spine and skull that act as a pillar. Fascia connects the spine to the clavicle and scapula (the deck) in order to suspend the arms over the ribs. Understanding that the arm structure is naturally suspended rather than held up through muscular effort will allow the trumpeter to have free and balanced arms.

Upper Arm and Elbow Placement

A common question among trumpeters is: How far should the elbows be from the body? There is not an exact answer because all trumpeters are different sizes, however, buoyant and balanced elbows are qualities to strive for. Buoyant and balanced elbows allow free and unrestricted breath, free upper arms and neck, and a balanced AO joint. There are two common extremes when it comes to elbow placement, both of which should be avoided. In the first extreme, which is often a result of damaging marching band practices, the elbows are lifted high so the humerus is level with the collarbone. Trumpeters standing in this manner generally have their 'shoulder region' pulled back and are standing with a straight spine. These three issues

[49] Vining, *What Every Trombonist Needs to Know About the Body,* 86.

compound into tremendous tension throughout the body. Several examples of "marching band" elbows are demonstrated below.

Figure 17: Marching Band Elbows

The pictures above demonstrate some of the drawbacks of the "marching band" arms. In the picture on the left, it is apparent that the AO joint is not aligned with the lumbar core and the weight of the body is too far back. When the weight is distributed in this way, the abdominals engage to hold the torso in place, the knees lock, and the leg muscles contract. Locked knees and muscular engagement contribute to general tension that restricts breathing and leads to misuse and fatigue. In both pictures, tension in the upper arms and neck is fairly obvious. Finally,

holding the trumpet becomes an unnecessary challenge when marching band elbows are present. Over gripping and squeezing the instrument feels necessary to support the instrument.

Holding the elbows against the body is another unacceptable position. While this may at first feel comfortable and relaxed, the end result does not contribute to efficient trumpet playing.

Figure 18: Compressed Elbows

In the picture above and left, it is clear that elbows against the body pull the torso forward. With the head down and torso leaning forward, the AO joint does not align with the lumbar core and the natural supportive structure of the spine collapses. Often times, when

players adopt this arm position, the elbows squeeze inward in order to help support the torso. This locks the arms into place and restricts the movements of breathing. When the elbows are against the body the natural buoyancy and support of the spine is abandoned.

The correct elbow balance is between the previous two extremes.

Figure 19: Balanced Elbows

As demonstrated above, buoyant and balanced elbows help the AO joint line up with the lumbar core. This alignment enables free arms, back, and neck. Different sized trumpeters will need to discover for themselves how to achieve buoyant and balanced elbows.

Movement Activity

Stand at balance while holding the trumpet. Pretend you are about to play and check the following Body Mapping points:

AO joint over lumbar core

Weight centered over the arch of the foot

Free upper arms, no tension

Free neck, no tension

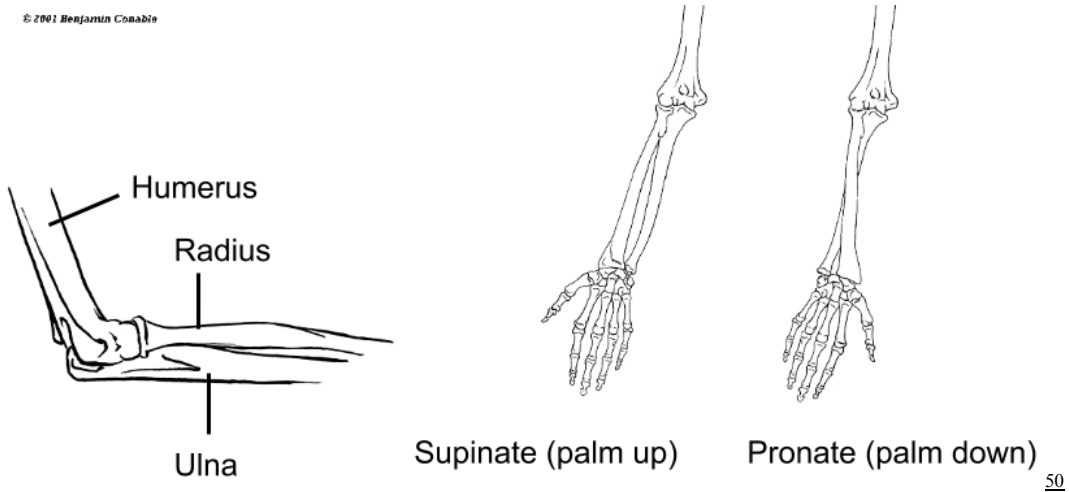
When you can confirm all of these points, you have found balanced elbows. Try going through this checklist each day during your warm up.

Lower Arms

The lower arm region consists of the elbow, forearm, wrist and hand. The lower arms are extremely important for trumpet players to map correctly. Correctly mapping the lower arms will enable free fingers that can quickly strike valves and move slides.

Elbow and Forearm

Figure 20: Lower Arms



[50]

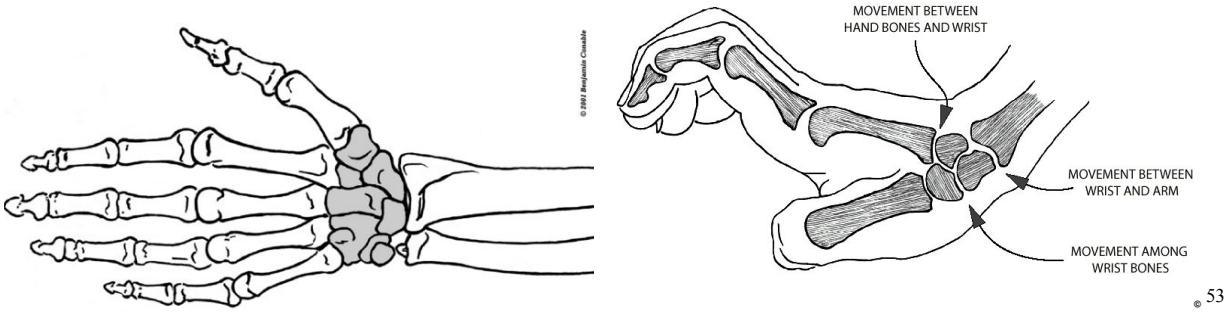
The elbows are the joints between the humerus and the two bones in the forearms (radius and ulna.) The elbows allow for two separate movements, bending in and out and turning up and down (also known as supination and pronation.) When the palms face up, the bones of the forearm are uncrossed in the supinated position. When the palms are turned down, the bones of the forearm are crossed in the pronated position.[51] Many people have mapped pronation and supination happening at the wrist. They are actually initiated at the elbow joint. When one allows the whole forearm to participate in pronation and supination, they become quite effortless.

[50] Benjamin Conable, "Benjamin Conable Images," Andover Educators, *http://www.andovereducators.wildapricot.org/page-1704501* (accessed March 17, 2016).
[51] Conable, *What Every Musician Needs to Know About the Body,* 58.

Wrist

The wrist consists of eight small bones that work together to allow movement. The wrist is not a single joint but a network of eight bones all moving together. Movement occurs throughout the entire wrist, not in a singular location.[52]

Figure 21: The Wrist



[53]

The wrist is often mismapped as a hinge joint. Mapping the wrist as a hinge joint puts strain into wrist area and restricts finger movement. A general result of the strain caused by this mismapping is carpal tunnel syndrome.[54] For trumpet players, restricted finger movement is problematic when using the valves. In passages where the third valve is used in rapid succession, mapping the wrist as a hinge joint will keep the wrist from accommodating the ring finger. Normally, the first two valves are most commonly used and the right hand will naturally adapt to accommodate the index and middle fingers. It is common for trumpet players to become so accustomed to this hand position that they forget other hand positions are possible. The right

[52] Conable, *What Every Musician Needs to Know About the Body,* 64
[53] Benjamin Conable, "Benjamin Conable Images," Andover Educators, *http://www.andovereducators.wildapricot.org/page-1704501* (accessed March 17, 2016).
[54] Conable, *What Every Musician Needs to Know About the Body,* 64.

hand becomes locked into a single position. Using the third valve while the hand is positioned to accommodate the first two valves is clumsy and inefficient. If the wrist turns slightly outwards placing the hand more in line with the ring finger, the ring finger will be able to strike the third valve more efficiently increasing speed and accuracy.

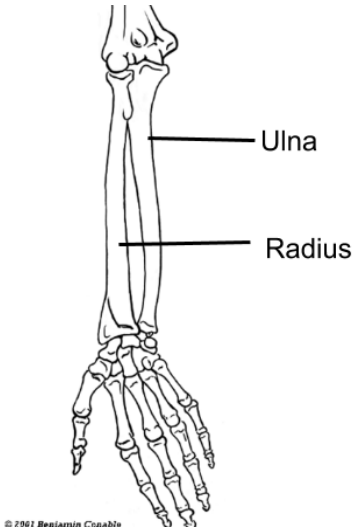
Figure 22: Accommodating Fingers

The picture above and left shows the wrist turning out slightly to accommodate the ring finger while the picture on the right shows the wrist turning in towards the index and middle fingers. Remembering the wrist is capable of many directions of movement allows the trumpet player to smoothly and efficiently navigate awkward fingering passages. Observing piano and string players can help trumpeters become aware of how the wrist can aid the fingers.

Ulnar Deviation

Ulnar Deviation is a term referring to a mismapping common throughout all instrumentalists. This mismapping comes from misunderstanding the natural alignment of the hand and forearm.[55] Trumpeters who display ulnar deviation will align the thumb with the radius, as shown below.

Figure 23: Ulnar Deviation

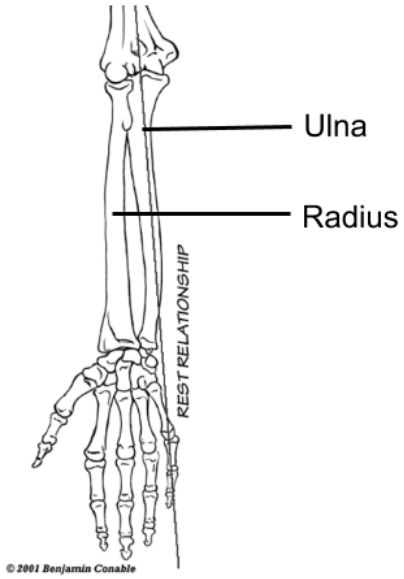


[56]

The correct resting position of the hand aligns the little finger with the ulna, as shown below.

[55] Conable, *What Every Musician Needs to Know About the Body,* 62.
[56] Benjamin Conable, "Benjamin Conable Images," Andover Educators, *http://www.andovereducators.wildapricot.org/page-1704501* (accessed March 17, 2016).

Figure 24: Ulnar Alignment



[57]

Ulnar deviation in trumpet players is most problematic in the left hand. When holding the valve block, the left thumb is the most obvious finger of the left hand. Trumpet players can not readily see the other fingers. Trumpeters tend to align the forearm with the thumb because it is the most apparent option. Unfortunately, aligning the forearm with the thumb results in ulnar deviation, as shown below and left.

[57] ibid.

Figure 25: Ulnar Deviation and Correction

In the left picture, the wrist is cramped and tense as a result of ulnar deviation. The picture on the right demonstrates a well aligned forearm resulting in a more relaxed and free hand and wrist.

A second problematic left hand position is the pistol grip. As demonstrated in the picture above and right, all of the fingers on the left hand should be resting on the third valve slide. This keeps the fingers in a neutral position and enables efficient access to the slides. Trumpeters using the pistol grip will place the little, ring, and sometimes middle fingers below the third valve slide and onto the third valve casing, as demonstrated below.

Figure 26: Pistol Grip

The pistol grip enables trumpeters to pull the trumpet in towards the face with more force. Throughout the years, many iconic lead trumpet players including Maynard Ferguson, Arturo Sandoval, and Cat Anderson have employed the pistol grip. While there is an undeniable correlation between the pistol grip and successful lead trumpet playing, the general trumpet population will not benefit from using this hand position. The pistol grip encourages the left hand to adopt a deviated position, especially when two or more fingers are wrapped on the casing. Second, pulling the trumpet harder into the embouchure is a habit to avoid. This puts strain on the wrist as well as the muscles in the face. Constant strain can increase the risk of injury in both the hand and face.

Chronic ulnar deviation cramps the hand and will put pressure on nerves in the wrist. Over time, this pressure can radiate pain into the forearm and fingers making playing painful or impossible. Generally, the left forearm, wrist, and hand are in a fixed position while holding the

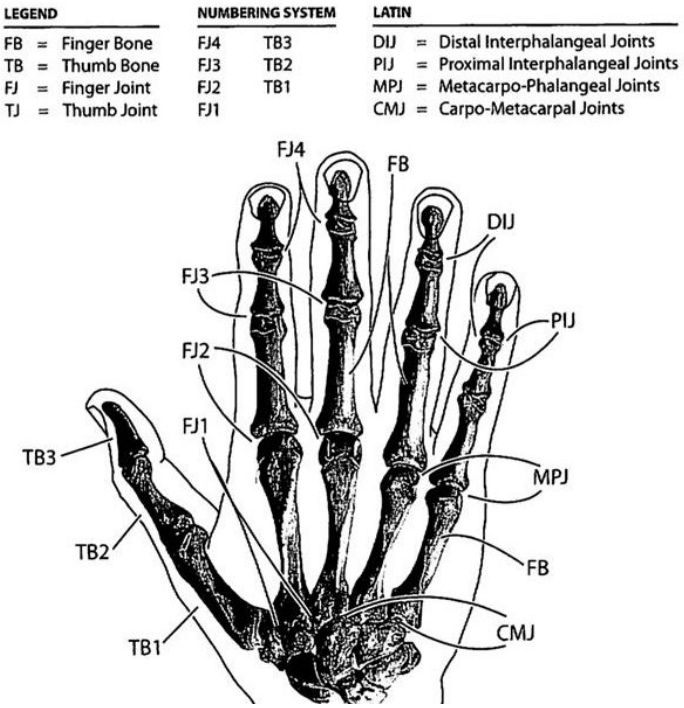
trumpet. This left hand needs to be correctly mapped in order to avoid potential injury due to misuse.

Hands

The bone structure of the hand is amazing in its function and versatility. Trumpet players must understand the structure of the hand in order to hold the body of the instrument and correctly move the

slides and valves.

Figure 27: The Hand



[58]

[58] Benjamin Conable, "Benjamin Conable Images," Andover Educators, *http://www.andovereducators.wildapricot.org/page-1704501* (accessed March 17, 2016).

The structure of the thumb is often mismapped. In the picture above, notice how the base of the thumb connects near the wrist. The middle joint in the thumb is often mismapped as being the base. This mismapping restricts the movement of the thumb and brings tension into the hand. For trumpet players, mismapping the base of the thumb can cause problems in the left hand while holding the instrument and moving the first valve slide.

Holding the trumpet can be a struggle for trumpet players with small hands, especially children. If children mismap the thumb as being shorter than it really is, holding the valve casing can seem impossible. Instead of allowing the thumb to extend from its base, children will attempt to over extend the thumb's middle joint to make their grip wide enough to hold the valve casing. Overextension causes tension in the hand that can extend into the muscles of the shoulder and neck. If children understand the thumb moves from its base near the wrist, the thumb will open wide enough to hold the valve casing and support the trumpet.

Extending the first valve slide (with the thumb) compounds the issue of holding the trumpet. Most pedagogues agree that teaching children to use their slides as early as possible instills good habits. This philosophy presents an anatomical problem. In most children, extending the first valve slide using the natural range of motion available to the thumb is impossible. One solution to this problem is installing a slide trigger for the thumb. The slide trigger would enable the trumpeter to squeeze the trigger with the thumb to extend the slide. Another possible solution would be a very narrow thumb saddle. Most thumb saddles are relatively wide which results in the thumb beginning to extend without moving the slide. A narrow saddle would allow the slide to move more closely with the thumb. If the trumpeter is unable to use the natural range of motion to extend the first slide and no alternative option is available, it is preferable to avoid

using the slide rather than incorrectly use the slide. Straining to open the first slide causes strain in the sound and enforces bad habits. In this circumstance, a note played slightly out of tune with a good sound may be better than an in tune note played with a strained sound.

The little finger, ring finger, middle finger, and index finger share similar bone structures to one another. The metacarpals extend from the wrist bones through the palm and meet with the phalanges under the knuckles at the metacarpophalangeal joint. The next joint is called the proximal-phalangeal joint, and the final joint is the distal-phalangeal joint.[59] The proximal and distal-phalangeal joints are hinge joints, which allow for a single plane of motion. The metacarpo-phalangeal joint is a condyloid joint which allows for two planes of motion. Notice how the metacarpo-phalangeal joint (under the knuckles) is able to move up and down and side to side.

The proximal and distal-phalangeal joints are easy to map and are in line with the creases on the palm of the hand. This is not true for the metacarpo-phalangeal (MCP) joint.[60] The crease at the base of each finger on the palm of the hand is misleading. This crease actually falls in the middle of the first phalange, not at the joint. The MCP joint is located beneath the large knuckles on top of the hand, some distance below the misleading crease on the palm.

Mismapping the MCP joints can cause problems in the trumpeters right hand. Thinking the fingers are shorter than they may be is one of the factors that leads to using flat fingers to press the valves. Trumpeters fingering the valves with flat fingers display a restricted and tense range of motion. Mismapping the MCP joint causes trumpeters to try to initiate their finger motions from the misleading finger crease. Attempting to initiate movement from the false

[59] Benjamin Conable, "Benjamin Conable Images," Andover Educators, *http://www.andovereducators.wildapricot.org/page-1704501* (accessed March 17, 2016).
[60] Conable, *What Every Musician Needs to Know About the Body,* 68.

finger crease will create tension in the fingers and lead trumpeters to flatten their fingers. Pressing the valves with flat fingers makes it appear that the fingers are moving from the mismapped MCP joint. When the fingers are flat, the finger joints do not possess their usual freedom of motion. Mismapped MCP joints cripple the hand and create tension which radiates up the arm. Correctly mapping the MCP joint allows the fingers to retain their natural curved shape. Natural curvature in the fingers allow for a free, fast, and efficient striking of the valves.

Figure 28: Flat and Curved Fingers

The picture above and left shows a flat finger position while the right picture demonstrates a natural curved hand structure.

One final subject of dispute in trumpet pedagogy is the use of the pinky ring. Almost all trumpets are equipped with a ring or hook on top of the lead pipe that enables the trumpeter to support the weight of the trumpet with the right hand. The pinky ring support is necessary during mute changes, plunger mute passages, and fast page turns. Outside of these situations, placing the pinky finger in the ring should be avoided. When the pinky finger is in the ring it encourages

pulling the trumpet into the embouchure, restricts movement of the other fingers, and prohibits any rotation at the wrist. Young players are often tempted to use the pinky ring because it helps them to support the trumpet, however, once supporting the trumpet with the left arm becomes a habit, using the pinky ring can be avoided. A free pinky leads to free fingers and free wrists.

Chapter 3

Mapping the Trumpet

At times, even if the body is properly mapped, a trumpeter will struggle to physically achieve a musical goal. There are many possible reasons for this, however, often times the struggle stems from fundamental misconceptions regarding how sound is produced on the trumpet. While Body Mapping is crucial, correctly mapping sound production on the trumpet is also important. Mismapping the trumpet will have similar crippling results to mismapping the body. Players who have mismapped the trumpet may have a weak sound quality, lack endurance and flexibility, and feel unable to progress in their trumpet playing. The body/trumpet interface and the listening space are two aspects of sound production that tend to harbor the most confusion resulting in trumpet mismappings.

The trumpet is a member of the brass family. As such, air initiates vibration at the lips which is amplified in the instrument and emerges as trumpet sound. The air and lips can work together to create different sounds. Properly mapping how the body/trumpet interface functions enables the trumpeter to make well informed decisions on creating the sound they are desiring.

The body/trumpet interface is the region of contact between the lips and the mouthpiece. This interface is the point of vibration that initiates trumpet sound. While equipment such as mouthpieces and trumpets do have some bearing on an individual's sound, the vast majority of a trumpeters sound quality is conceived at the point of vibration. The quality of the vibration at the body/trumpet interface is the most direct indicator of the quality of sound a trumpeter will produce on a trumpet. How should the trumpet player check to be sure the vibration, more

commonly referred to as the 'buzz,' they are creating is full and vibrant? The best option is mouthpiece playing away from the trumpet. The buzzing sound generated from playing the mouthpiece is the most direct indicator of how the point of vibration is functioning. If the mouthpiece buzz is intense, full, and maintains a clear pitch center, the resulting trumpet sound will mirror those qualities. If the mouthpiece buzz is diffuse, anemic, and uncentered, the resulting trumpet sound will mirror those qualities. The better the buzz, the better the trumpet playing.

Range and Volume

Two principles that trumpet players must be concerned with regarding sound production are range and volume. Different ranges and volumes require different movements of air and lips. Range is always a concern for the trumpet player, especially the upper register. The higher the range being played on the trumpet, the faster the lips must vibrate**.** Fast air focused at the point of vibration is required to produce fast lip vibrations. To play well in the low register, the lips must vibrate more slowly. Slower broader air causes the lips to vibrate at a slower rate. A good visual representation would be that of a hose nozzle. If the nozzle is focused, water travels very quickly through the focused opening. If the nozzle is unfocused, the water travels slower through the broad opening.[61]

Arnold Jacobs, a father of modern brass pedagogy, supported a sound based buzz approach to range. In Brian Fredricksen's book, "Arnold Jacobs: *Song and Wind,"* Jacobs is quoted saying, "Instead of hard blowing, move toward a bigger sound based on the buzz of the

[61] David Vining, *The Breathing Book: Trumpet Edition,* (Flagstaff, AZ: Mountain Peak Music, 2009) 19.

embouchure. Zero-in on the buzz of the lips in a lower octave then keeping the same feeling for buzz, play in the upper octave."[62] Notice that Jacobs specifically instructs to move away from "hard blowing." This correctly suggests that fast efficient air resulting in a free "buzz feel" will result in a ringing upper register.

Different dynamics are created through different volumes of air traveling through the point of vibration. Soft dynamics require a smaller volume of air while loud dynamics require a larger volume of air. Understanding the effects of air quantity and quality at the point of vibration allows trumpeters to correctly control their range and volume.

Overblowing

Overblowing is the act of trying to force too great a volume of air into the trumpet. Overblowing will result in lack of response, limited range, and an uncentered sound. Overblowing is perpetuated by many phrases common in trumpet pedagogy. "Use more air," "blow to the back of the room," and "fill the trumpet with air," are common phrases that mislead students to overblow.

"Use more air," is universally overused in brass pedagogy. The problem with this phrase is that it is an unclear command. More airspeed or more air volume? How should the player go about using more air? What is the desired sound difference of using more air? "Use more air" is often directed at entire trumpet sections. This can be particularly disastrous because each player will respond differently to the given request. Generally, students respond to "use more air" by trying harder to force more air into the trumpet and overblowing the instrument. If pedagogues

[62] Brian Fredricksen, *Arnold Jacobs: Song and Wind,* (Grayslake, IL: Windsong Press, 1996) 126.

understand how air speed and volume affect trumpet sound, they can more accurately diagnose the trumpet problem they are hearing. Simply stating "direct faster focused air at the point of vibration" or "increase the volume of air at the point of vibration" will give students a specific command that has more consistent and direct results.

"Blow to the back of the room," is another phrase that supports overblowing. This phrase supports mismapping the amount and quality of air required to create an efficient vibration. Remember, it is the point of vibration that defines the sound. If a trumpeter is truly trying to blow to the back of the room, the lips will be blown apart and the vibration will cease or become airy. Attempting to blow to the back of the room also expends a great deal of energy. Trumpeters only need to blow enough air to support a sustained, vibrant, and centered buzz into the mouthpiece. If the trumpeter directs energy towards creating a healthy point of vibration, the air can move with a clear and correct goal which focuses the sound. The amount of air required to sustain a healthy focused vibration is much less than if trying to blow to the back of a room. Generally, pedagogues using these phrases are trying to encourage their students to get a bigger and more vibrant sound throughout the range of the instrument. Directing students to "create a focused and full buzz" would support a correct mapping of the trumpet and yield better results than "blowing to the back of the hall."

"Fill the trumpet with air," and "blow through the trumpet" also mislead students towards overblowing. These phrases mismap the trumpet by suggesting that trumpet players need to blow air all the way through the instrument in order to create a good trumpet sound. While a trumpet player does need to blow air to the lips creating a full and focused vibration to get a good sound, this air does not need to be blown through or fill up the trumpet. The trumpet is already full of air

and blowing air into the instrument without any vibration does nothing. Pedagogues using these phrases are generally encouraging their students to try to find a more vibrant and supported sound. This kind of sound is created through a vibrant and supported buzz. Encouraging this kind of vibration would be a valuable replacement to "filling up the trumpet with air."

With a correct mapping of trumpet sound production, problems regarding range, dynamics, and overblowing have clear solutions. Also, common phrases that support mismapping the trumpet can be exposed and replaced with clearer directives. Mapping sound production is clearly beneficial to the trumpet community.

Mapping the Trumpet Sound

There are two characteristics of trumpet sound that are helpful to understand and consider when playing the trumpet. The first regards how trumpet sound changes in different dynamics. The difference in sound between a trumpet playing loud and soft is dramatic. One might say that it can almost be perceived as two different instruments. When the trumpet is played softly, it has a delicate and sweet sound. When played at a loud dynamic, the sound becomes brassy and piercing. The higher the register, the more pronounced this phenomenon becomes. This change of sound is due to the change in harmonics projected at different volumes.[63] At soft volumes there are fewer harmonics of high frequency. At loud volumes, high frequency harmonics are projected at a much greater rate which accounts for the change in the sound. Knowing what is changing in the sound and how to change timbre is an important tool for all trumpet players.

[63] Joe Wolfe, "Brass Instrument (Lip Reed) Acoustics: an Introduction," University of New South Wales, *http://newt.phys.unsw.edu.au/jw/brassacoustics.html* (accessed March, 21).

The second characteristic has to do with how the ear perceives high versus low pitch. The ear is most sensitive to sounds between two and four octaves above middle C.[64] This is important information for the trumpet player. Playing in the upper register of the instrument is naturally more taxing. Trying to play loudly in the upper register is the most physically demanding type of trumpet playing. If the trumpeter is aware that the audience naturally hears the upper register more readily, the trumpeter with the top voice can focus on blending with the surrounding voices rather than pushing to play as loud as possible. The audience will hear the upper voice because of the natural sensitivity of the ear.

Mapping the Performance Space

An unfortunate reality of trumpet playing is that the player will never be able to hear him or herself as an audience member would. A trumpeter's job is to project musical ideas to an audience and it is important that the player be as aware as possible of the audience perspective. By mapping the musical space the trumpeter can cultivate a more accurate audience listening perspective.

Most trumpet players practice in spaces much smaller than their performance space. While performing, the way a trumpeter must listen is different between small and large spaces. In practice rooms, the sound does not project far and the sound feedback is immediate. In larger performance spaces the sound feedback takes longer to receive and also may seem distant. If a trumpet player has not accurately mapped the space in which they will be performing, it is possible that they will attempt to get the same feedback from the performance space that they

[64] ibid.

were getting in the practice room. In search of more immediate and present feedback, trumpeters may compensate by trying to play louder and force the sound. Not only will this fail to accomplish a more direct feedback but it will likely sound forced to the audience. By mapping the performance space, a trumpeter can understand and anticipate how to listen during their performance. This allows the trumpeter to play comfortably in the moment of performance.

A second implication of a small practice room is that the mind controls how the body reacts to different environments, often subconsciously.

Movement Activity

Below are several environments that most people can relate to. Imagine how your body reacts to being in the following environments.

-A grassy field on a sunny day

-A closet or crawl space

-A concert hall stage

-A small practice room with fluorescent lighting

Each of these environments likely generate a different response from the body. Generally, the mind commands the body to conform in some way to the space it is occupying. When imagining a closet or crawl space, the mind likely commands the body to become more constricted with drawn in shoulders. Alternatively, the mind commands the body to be fairly balanced and free when imagining the comfortable environment of a grassy field. These are conditioned responses that come from life experience.

These same physical responses need to be considered with regards to practice and performance spaces. Many practice spaces are fairly small, poorly lit, and generally uninviting. How are the mind and body conditioned to respond to spaces with these characteristics? Generally, the mind encourages the body to mirror the space it is occupying. In small spaces the upper arms and elbows draw in and the spine collapses forward. Allowing the body to mirror cramped practice spaces sabotages a balanced and free body. This has a direct impact on sound production. If the body is constricting, the trumpeters sound and musical ideas will also be confined to the practice space.

Thankfully, there are methods to counteract this phenomenon. First, the trumpeter must remember that the mind is in control and must accommodate the movements of the body. While the practice room may not be similar to the performance space, the trumpeter must occupy and command the practice space as if it were the performance space.[65] It is easy to let practice rooms restrict the movement and musical space the trumpeter requires for complete musical expression. The trumpeter must acknowledge this and take control of the practice space. Before beginning a practice session, it is advisable to arrange the practice space in a way that enables free movement and expression. This will also allow the trumpeter to command and occupy the practice space in the same way he or she would command and occupy a stage. Even in the practice room, the musical ideas and sound of a trumpeter must strive to command the stage at a Carnegie Hall or Sydney Opera House.

Second, the trumpeter should schedule Body Mapping checkpoints throughout the practice session to ensure the body maintains balance and muscular freedom. During these

[65] Barbara Conable, "What to do About Performance Anxiety," Andover Educators, *http://bodymap.org/main/?p=206* (accessed March, 28 2016).

checkpoints, rekindle awareness of the AO joint, spine, pelvis, legs, and arms. Make sure that these structures are balanced and free.

Hearing Protection

An unfortunate irony for trumpet players is that the very sound they produce can be responsible for long term hearing loss and career ending damage. The ears are a part of the body and understanding their limits and how to protect them should be considered. Addressing hearing loss and protection has become a focus for musicians and their representative organizations over the last decade. National Association of Schools of Music (NASM,) The Association of British Orchestras, Australian Council for the Arts, and Medical Problems of Performing Artists Journal, among others, have recently funded and presented studies regarding hearing loss in musicians.[66] This focus is the result of growing concern regarding hearing loss in musicians. Trumpet players, especially, are at risk for hearing damage due to the decibels produced by the instrument. This is compounded by being situated in front of percussion and/or low brass sections in most ensemble settings. The biggest general problem is a lack of information and solutions to hearing damage in musicians. Humans only have one set of ears, and they are a musician's most important tool. Understanding how the decibels produced by a trumpet affect the ears is important to career longevity and general health.

How loud is too loud and for how long? According to the National Institute of Occupational Safety and Health (NIOSH,) hearing damage can occur anywhere above 84

[66] Kris Chesky and Amy Laursen, "Addressing the NASM Health and Safety Standard Through Curricular Changes in a Brass Methods Course: An Outcome Study," *Medical Problems of Performing Artists* (September 2014): 136-143.

decibels. The following table illustrates the possible duration of exposure that causes hearing damage according to NIOSH. [67]

Figure 29: Decibel Duration for Hearing Safety

Duration in Hours	**Decibels**
8	85
4	88
2	91
1	94
.5 (30 minutes)	97
.25 (15 minutes)	100
.125 (7.5 minutes)	103

The softer decibel range of the trumpet is generally measured between 85-90 dB[68] while the louder decibel range of the trumpet can be between 115-120 dB.[69] Applying this information to the table above should concern each trumpet player. When playing at the loudest volume in a reverberant practice room, hearing damage can be almost immediate. The two steps trumpeters can take to minimize hearing damage are using hearing protection and practicing in large spaces.

Thankfully, due to the growing concern for hearing health in musical circles, musician oriented hearing protection has become easy to find. Generally, musician earplugs come in filters that block anywhere between 9 and 25 decibels. Musician earplugs are preferable over generic

[67] Douglas T. Owens, "Hearing Loss: A Primer for the Performing Arts," *Medical Problems of Performing Artists* 23, No. 4 (December 2008): 151.
[68] ibid.
[69] "Noise Induced Hearing Loss: Know the Risk," Etymotic, *http://www.etymotic-media.com/sliderule/* (accessed March 25, 2016).

earplugs because they block high and low frequencies equally meaning the sound is the same, but softer. Generic earplugs distort the sound, blocking some frequencies more than others. [70]

Practicing and performing with hearing protection is becoming more accepted and advised for instrumentalists, especially brass players. Trumpeters should be aware that it takes time to adjust to playing and wearing earplugs. The brain will need to learn how to accept less sound feedback than it is used to. Similar to performing in a large hall versus a practice room, the trumpeter should be mindful to not overblow or play louder than normal. Recording and listening back to practice sessions and ensemble rehearsals can help the trumpeter to become more aware of dynamic level and blend while wearing earplugs.

The second step trumpeters can take to protect their hearing is practicing in bigger spaces. Practicing in small and reverberant rooms reflects most of the trumpet sound back into the ears. Smaller practice rooms are much louder than bigger spaces. Practicing in the biggest available space will protect the trumpeters hearing and promote a reverberant and projecting sound.

[70] "Musician Earplugs," Etymotics, *http://www.etymotic.com/* (accessed March 25, 2016).

Conclusion

Body Mapping and Body Mapping related research has become increasingly popular in recent years. Many articles, dissertations, and books have been written specifically for separate instruments. Trombonists, oboists, violinists, and pianists have books providing Body Mapping information for their instruments. Currently, with the exception of a breathing workbook for trumpet,[71] there are no books or dissertations presenting trumpeters with Body Mapping material specifically for trumpet. This paper was written to address the need for trumpet related Body Mapping information. By providing three Body Mapping lessons written specifically for trumpeters, this paper serves as a trumpet specific Body Mapping resource.

Trumpet players can benefit greatly from Body Mapping. By debunking misinformation present in traditional trumpet pedagogy, providing correct and relevant anatomical information, and principles from which to apply this anatomy, Body Mapping has the potential to prevent injury and enable freedom of movement to trumpet players of all ages and abilities.

The lack of Body Mapping information for trumpeters is problematic in very real ways. High injury rates due to misuse as well as the acceptance of incorrect anatomical information presented as pedagogical truth are themes found throughout the trumpet world. The chapters presented in this paper represent a step towards integrating Body Mapping into trumpet pedagogy.

Sitting and standing are the two states of balance that trumpeters most often occupy. There is a surprising amount of false information regarding these two states of balance. Incorrect

[71] David Vining, *The Breathing Book: Trumpet Edition* (Flagstaff,AZ: Mountain Peak Music, 2009).

anatomical information and common sayings such as, “stand up straight,” encourage mismapping these two states of balance. Trumpet players can begin to develop correct body maps by replacing traditional misinformation with anatomically correct material supplied by the Andover Educators. Body maps need to be cultivated and practiced just like music itself. *Movement Activities* directed towards sitting and standing for the trumpeter are helpful to incorporate into daily practice routines so that Body Mapping becomes a regular practice.

Trumpet players rely on the arms to play the trumpet. The arms are used to finger the valves and support the instrument. Similarly to sitting and standing, trumpeters commonly mismap the structures of the arms. Replacing “shoulders” with specific arm structures, cultivating an awareness of ulnar alignment, and understanding how the arms are suspended over the skeletal structure will all help the trumpeter develop an accurate arm Body Map. Trumpet players that have correctly mapped their arms are able to support the weight of the trumpet without excess muscular engagement, have free and balanced arms, and their fingers will be able to quickly and efficiently strike the valves. This will lead to effortless technique and healthier trumpet playing.

Mapping the trumpet is equally important to mapping the body. In order to play the trumpet successfully, the trumpeter must understand how sound is produced as well as how the body responds to trumpet sound in different environments. Correctly mapping the point of vibration and knowing how to move in order to change registers and dynamics allows the trumpeter to navigate the instrument correctly. Understanding some physical properties of trumpet sound and how the body reacts to trumpet sound enables the trumpeter to maintain healthy ears and successfully prepare for performances when in the practice room.

Suggestions for Further Research

This paper presents foundational work for trumpet specific Body Mapping. Further trumpet specific research and information should be presented on mapping the face, mouth, and breathing. Body Mapping related material including applied Alexander Technique, inclusive awareness, constructive rest, and successfully managing performance anxiety would also be beneficial to trumpeters. Also, while this paper does provide some practice activities to help integrate Body Mapping into a trumpeter's routine, a resource containing further exercises for practice is recommendable.

Body Mapping resources should be available for every instrument. French horn and tuba are two other brass instruments that have little Body Mapping information available.

Annotated Bibliography

Aleksandersen, Rune. "The Comeback Trumpet Players Guide." http://abel.hive.no/ctg/ (accessed May 12, 2014).

> This website is tailored to address the needs of the comeback trumpet player. Physical issues, practice techniques, equipment questions, musical material, and a guide to getting back into shape are all topics on the website. There is a success story page that would help to inspire many a comeback player. Although this site may not be the most extensive, I think it would be a great place to start for anyone looking to get back in the game.

Andover Educators: Teaching the Art of Movement in Music. http://bodymap.org/main (accessed May 11, 2014).

> Bodymap.org is the homepage for Body Mapping as it relates to musicians. On this website you can find a list of teachers in your area, information on the how body mapping works and is applied in lessons, links to resources related to Body Mapping, and information about being a Body Mapping teacher. This website seems like a great one stop shop for all things related the Body Mapping.

Baadjou, Vera, Marjon van Eijsden-Besseling, Ans Samama-Polak, Rob Smeets, Valeria Lima Passos, Klaas Westerterp. "Energy Expenditure in Brass and Woodwind Instrumentalists: The Effect of Body Posture." *Medical Problems of Performing Artists* (December 2011): 218-223.

> This article studies the effect of body posture on energy expenditure during instrumental performance. The article concludes that body posture does have an impact on energy expenditure.

Bindel, Jennifer. "The Collaborative Pianist and Body Mapping: A Guide to Healthy Body Use for Pianists and Their Musical Partners." PhD diss., Arizona State University, 2013.

Buchanan, Heather. "An Introduction to Body Mapping: Enhancing Musical Performance Through Somatic Pedagogy." *The Choral Journal Vol. 45, No. 7* (February 2005): 95-101.

Campos, Frank. "A View From My Practice Room," *International Trumpet Guild Journal* (January 2010): 51-53.

In this article, Campos discusses some ways in which he prepares to start his playing day. He uses Qigong exercises to maintain his playing vitality.

Campos, Frank. "Hara and the Reverse Breath, Part 1," *International Trumpet Guild Journal* (January 2011): 53-55.

Campos discusses the Hara point (one to two inches below the belly button) and how this balance/power point can assist in trumpet playing. He suggests bringing focus to the hara while playing to see how you are utilizing it.

Campos, Frank. "Visualization for Musicians," *International Trumpet Guild Journal* (February 1996): 71.

In this article Campos talks about visualization techniques that musicians can employ to improve performance consistency.

Caplan, Stephen. *Oboemotions: What Every Oboe Player Needs to Know About the Body.* Chicago: GIA Publications, 2009.

Oboemotions is the Body Mapping book for oboe players. Of particular interest to trumpeters is the information on the embouchure, tongue, and mapping the oboe. Correctly mapping the embouchure and tongue is important for oboe players and trumpeters alike.

Chesky, Kris. "Music, Health, and Education: Toward a Greater Understanding," *International Trumpet Guild Journal 42* (January 2004): 42-43.

Chesky summarizes the goals of a 2004 project funded by NASM and the National Endowment for the Arts. This project has the goal to establish core content for health related musical programs. Chesky served as the International Trumpet Guild representative in this project.

Chesky, Kris. "Teach Trumpet Students Early and They Will Listen," *International Trumpet Guild Journal* (January 2006): 41.

Chesky's introduction to the article chronicles the lack of information regarding hearing related damage to students during their K-12 years. He states that this lack of information stems not from a lack of knowledge or published material, but instead from a disagreement on what information should be taught in the classroom. In this article he

addresses teachers and asks that they begin to inform their music/trumpet students about hearing related damage that can occur as a result of music. His goals for the music teacher are to create awareness and concern among music students regarding music related hearing loss, to promote healthy beliefs about and hearing loss and positive attitudes towards prevention, and finally to inform students how to reduce the risk of hearing loss. His article goes into detail about how to accomplish all of these goals.

Chesky, Kris, William Dawson, and Ralph Manchester. "Health Promotion in Schools of Music: Initial Recommendations," *International Trumpet Guild Journal* (January 2007): 55.

This article outlines the objectives and desired effects of the Health Promotion in Schools of Music Project. The problems identified by this project were: Musicians were sustaining preventable injuries, these injuries were due, in large part, to a general lack of knowledge regarding musical health, schools of music had no consolidated agenda for informing their students about health related hazards of music performance or injury prevention. The project asks that schools of music adopt a health promotion framework, develop and offer an occupational health course for all music majors, educate students about hearing loss as part of ensemble based instruction, and assist students through active engagement with health care institutions.

Chesky, Kris, Karendra Devroop, and James Ford. "Medical Problems of Brass Instrumentalists: Prevalence Rates for Trumpet, Trombone, French Horn, and Low Brass." *Medical Problems of Performing Artists* (June 2002): 93-98.

This article studies health problems developed by brass players. The study categorizes injuries by region of the body and instrument.

Conable, Barbara. *What Every Musician Needs to Know about the Body: The Practical Application of Body Mapping to Making Music.* Chicago: Andover Press, 2000.

This book uses images and exercises to help the musician to better understand the structures, functions, and size of their body. This is an easily approachable resource for any musician who wants to increase their understanding of their body and how it relates with their instrument.

Conable, Barbara. *The Structures and Movement of Breathing: A Primer for Choirs and Choruses.* Chicago: GIA Publications Inc., 2000.

This book is designed to be used in choir rehearsal in order to help the singers accumulate

more accurate anatomical understanding. There are helpful images and explanations regarding the process of breathing. This book is obviously great for any singer, however, wind instrumentalists could also benefit from it.

Copeland, Shawn. "Applied Anatomy in the Studio: Body Mapping and Clarinet Pedagogy." PhD diss., University of North Carolina at Greensboro, 2007.

In this dissertation Copeland gives a background of Body Mapping and demonstrates several lessons for its implementation into the clarinet studio.

Dawson, William J. *Fit as a Fiddle: The Musician's Guide to Playing Healthy.* New York: Rowman and Littlefield Education, 2008.

Fit as a Fiddle is an incredibly approachable book written by an international authority in musicians medicine. This book provides basic information on body structures and their functions as well as common performance related health issues and preventative measures. Generally, this is an excellent resource for any musician be it a performer or teacher for better understanding performance health.

Dawson, William J. "Where Can a Musician Get Health-Related Information?" *International Trumpet Guild Journal* (March 2006): 55.

This concise article gives information on useful sources that musicians can turn to in order to get information on performance-related health information. Artsmed.org and other sources are noted. Dawson gives some advice on how to differentiate between solid reliable material and questionable material.

Devroop, Kerendra, and Kris Chesky. "Comparison of Biomechanical Forces Generated During Trumpet Performance in Contrasting Settings." *Medical Problems of Performing Artists* (December 2002): 149-154.

This study investigates the force of mouthpiece pressure under varying conditions. Force on the upper and lower lips and pharyngeal pressure are measured.

Dystonia Medical Research Foundation. http://www.dystonia-foundation.org (accessed May 11, 2014).

The Dystonia Foundation is a global organization geared toward discovering a cure for dystonia. This website provides information on current research, basic symptoms and

causes of dystonia, tips for living with dystonia, and ways to get involved. This website would be an excellent resource for someone interested in or dealing with dystonia at any level.

Fabra, Joaquin. musicandystonia.com (accessed May 11, 2014).

Fabra is a musician who has been researching music related dystonia for decades. On this website there is information regarding causes and symptoms of dystonia. The best thing about this website, in my opinion, are the videos that document dystonia recoveries. These videos would definitely present hope to anyone suffering from dystonia.

Faulkner, M., E.P. Sharpey-Schafer. "Circulatory Effects of Trumpet Playing." *The British Medical Journal 1* no. 5123 (March 1959): 685-686.

This article summarizes an early study done of the effects of trumpet playing on the circulatory system. Specifically, the authors were interested in the causes of the "blackout syndrome" that occurs when playing high and sustained passages. They concluded that trumpet does cause relatively high levels of intrathoracic pressure that can result in black-outs. These spells were not suspected to produce any long term problems. "For orchestras in severe financial difficulties it might be possible to dispense with the assistant trumpet player if the principle wore a pilots' pressure suit, which could be surreptitiously inflated by a switch on the conductor's desk."

Feldenkrais Method. www.feldenkrais.com (accessed May 11, 2014).

This website is the homepage for the Feldenkrais Method. On this website you can find a list of teachers in your area, information on the how the method works and is applied in lessons, links to resources related to the method, and information about being a Feldenkais teacher. This website seems like a great one stop shop for all things related the Feldenkrais.

Fjellmann-Wiklund, Annchristine, "Music Performance: Spice of Life or Aching Burden," *International Trumpet Guild Journal* (June 2006): 42-43.

Annchristine begins by acknowledging that musical health is a field that is developing a growing interest. She notes a study from 2004 in which 127 of 220 trumpet players experienced musculoskeletal problems within a year. She goes on to hypothesize that musicians normalize pain because it is such a standard byproduct of our practice. This normalization can be countered by teaching musicians body awareness techniques. The

article concludes that the denormalization of pain coupled with body awareness are both key to progress in the field of musical health. If pain is present, understanding what is causing the pain and taking measures to prevent this pain are essential. Fighting through the pain will only lead to further damage.

Ford, James. "A Scientific Characterization of Trumpet Mouthpiece Forces in the Context of Pedagogical Brass Literature." PhD diss., University of North Texas, 2007.

Ford wrote this dissertation in response to a request by NASM for research institutions better understand performance-related injuries. Ford found that out of all brass instrumentalists, trumpet players were the most likely to suffer from performance-related injuries. Ford's goal was to develop a working definition of mouthpiece force that can be applied pedagogically. Ford did not fully develop a working definition, however, he did conclude that there were 5 principles associated with mouthpiece force. These principles are as follows. There are always mouthpiece forces at work while trumpet playing, these forces are in a constant state of flux, these forces may function in order to accommodate pitch, dynamic, and playing duration, be representative of how players perform, and finally may potentially precipitate injuries in trumpet players.

Fredricksen, Brian. *Arnold Jacobs: Song and Wind.* Grayslake, IL: Windsong Press, 1996.

In this book, Brian Fredricksen gives a thorough account of Arnold Jacobs life and pedagogic methods. Of special use to this paper were the chapters regarding Jacobs ideas regarding the physical and mental elements of brass playing.

Fredrickson, Karen B. "Fit to Play," *Music Educators Journal 88,* no. 6 (2002): 38-44.

Fredrickson begins by noting that musicians are often injured by misuse or overuse. She goes on to cite that a good musical-physical warm up, stretching, and strength training are three essential elements that educators could implement in order to prevent present and future injuries in their students. Fredrickson gives several examples of exercises and stretches that would be beneficial to any music student. She also stresses the importance of helping the students to understand why and how these exercises and stretches are preventing injury.

Heartwig Knaub, Maribeth. "Body Mapping: An Instructional Strategy for Teaching the Alexander Technique to Music Students." PhD diss., University of Pittsburgh, 1999.

Illman, Richard and Jo Martinie. “Yoga for Trumpet Players: Breath Awareness and Alignment,” *International Trumpet Guild Journal* (October 2006): 59.

In this article the authors provide information on how basic yoga practices can be applied in order to improve trumpet playing.

Klickstein, Gerald. “The Musicians Way.” http://musiciansway.com/blog/ (accessed May 12, 2014).

This website is the product of Gerald Klickstein who is a former professor at the Peabody Institute. This website contains a wealth of wonderful information. The tabs on the front page are practice, performance, wellness, creativity, music careers and downloads. Under each tab there are a variety of links and articles related to the category. One unique feature of this website is an instrument specific resource page. Under the “trumpet” section there are links to youtube masterclasses and many other helpful trumpet related websites. This website would certainly be useful for nearly any musician!

Laursen, Amy, and Kris Chesky. “Addressing the NASM Health and Safety Standard through Curricular Changes in a Brass Methods Course.” *Medical Problems of Performing Artists* (September 2014): 136-143.

This article outlines the method and preliminary results of the NASM health and safety requirements in brass methods curriculums. The objectives, materials, and procedures of the curriculum are all outlined.

Lederman, Richard. “ Embouchure Problems in Brass Instrumentalists.” *Medical Problems of Performing Artists* (June 2001): 53-57.

This article outlined the findings of a long term study on dystonia in brass players. The article cites overuse as well as incorrect technique as the main precipitators for dystonia.

Musicians’ Clinics of Canada. www.musiciansclinics.com (accessed May 11, 2014).

This website is the product of two doctors, an MD and an Audiologist, who have focused their work on musicians. There is ample information on music related hearing loss, performance related injuries, and ample links to health related information. There is a good deal of information about diet and other holistic approaches to aid in performance and prevent injury. The majority of the information on this site is geared towards hearing loss prevention and other hearing related information.

Musicians With Dystonia Bulletin Board. http://www.dystonia-bb.org/forums/mwd (accessed May 11, 2014).

This forum presents a place where musicians with dystonia can pose questions, solutions, or anything dystonia related. Whenever a person is faced with a challenge, knowing you are not alone is always comforting. This would be a great resource for anyone who is suffering from dystonia.

National Trumpet Competition Website, "Minute Master Class Series." http://www.nationaltrumpetcomp.org/pages/page.asp?page_id=205562 (accessed May 12, 2014).

This website is one of the best resources generated by the National Trumpet Competition. This particular site includes an extensive list of "Minute Master Classes" given by some of the worlds best trumpet players and pedagogues. A quick perusal through these videos will give even the most advanced trumpet players something new to think about.

Owens, Douglas T. "Hearing Loss: A Primer for the Performing Arts," *Medical Problems of Performing Artists* 23, No. 4 (December 2008): 147- 154.

Pepping, Amanda. "A Look at the Role of Musical Wind Instruments in Asthma Therapy," *International Trumpet Guild Journal* (January 2009): 17-20.

Pepping's article takes a look at wind instruments as tools of asthma therapy. She talks about how scholarly studies have shown playing wind instruments has positive effects on asthma patients and even sometimes totally eradicates the asthma.

The Complete Guide to the Alexander Technique. http://www.alexandertechnique.com (accessed May 11, 2014).

Alexandertechnique.com is the homepage for all things relating to the Alexander Technique. On this website you can find Alexander Technique teachers, self-study resources, classes, videos, and interactive modules.

Rosenstein, Peter. "Trumpet Playing and Dentistry," *International Trumpet Guild Journal* (June 2005): 64-65.

This article is interesting historically. Rosenstein talks about important trumpet performers who have struggled due to lack of dentistry. Blue Mitchell, Chet Baker, Harry

James, Miles Davis, and Louis Armstrong all were victims of poor dental care. This lack of care had adverse effects on all of these performers careers.

Sanborn, Chase. "A Relaxed Playing Style," *The Canadian Musician 24,* no. 3 (May/June 2002): 30.

A Relaxed Playing Style briefly investigates some of the ways that trumpet players can discover a more relaxed relationship in regards to their approach to their instrument. Sanborn talks about being aware of how you are feeling every day and acknowledging that the body is in a constant state of flux. He focuses on taking time each day to rediscover your relationship with the trumpet through relaxed but intentioned warm up period.

Sanborn, Chase. "Efficiency vs. Brute Force," *The Canadian Musician 25,* no. 6 (November/December 2003): 30.

Chase Sanborn addresses trumpet playing by relating trumpet players to athletes. In the section "Tension is the Enemy" Sanborn relates efficient trumpet players to professional sprinters. Although there is a high level of muscular activity occurring, all unnecessary tension has been released in order to enable as much relaxation as possible. This would be a wonderful article for undergraduate trumpet students.

Sanborn, Chase. "Endurance," *The Canadian Musician 21,* no. 1 (1999): 28.

Sanborn talks about how good endurance comes more from proper playing technique than strength. He notes several exercises that the player can practice to slowly increase endurance.

Sehmann, Karin Harfst. "The Effects of Breath Management Instruction on the Performance of Elementary Brass Players." *Journal of Research in Music Education 48* no. 2 (Summer 2000): 136-150.

In this article Sehmann first discusses the importance of the breath in brass playing and studies that have been conducted to further understand how breathing affects brass players. She summarizes that many studies have taken place, however, there is little to no information on how to teach breathing to elementary level students. She then summarizes her experiment on breath management to brass students in grades 4-6. Sehmann concluded that breath management instruction did improve the performance of

elementary level brass students. Tone quality and duration of sound were the two factors that increased the most.

Vining, David. “davidvining.net” (accessed May 11, 2014).

Davidvining.net is an exellent resource for those dealing with a brass related playing injury. In 2002 Vining suffered a severe embouchure injury which inspired him to provide better resources to those going through similar situations. On this website there is a bibliography of books related to injury recovery and retraining, a list of retraining strategies, web links to reliable and helpful information, and a detailed account of Vinings own injury and healing process.

Vining, David. “mountainpeakmusic.com” (accessed May 11, 2014).

David Vining is a trombone professor at Northern Arizona University. His website, mountainpeakmusic.com, provides numerous published resources for brass players. Available on the website are books regarding body mapping, breathing, constructive rest, and general technique. The unique thing about this website is the strong emphasis on health related products.

Vining, David. *Trumpet Breathing Book.* Flagstaff, AZ: Mountain Peak Music, 2009.

This book was designed for trumpet players of all ages and ability. Vining explains the structures involved in breathing and presents images and practice techniques to help cultivate the trumpeters body map. This is currently the only printed Body Mapping resource specifically for trumpeters.

Vining, David. *What Every Trombonist Needs to Know about the Body.* Flagstaff, AZ: Mountain Peak Music, 2010.

This book is a thorough guide to Body Mapping for the trombone player. The book begins with explanations and introductions of Body Mapping concepts. Vining goes on to systematically identify the areas of the body that are crucial for the trombone player to understand for a healthy playing career. Images and exercises are added by Vining making this an interactive and engaging resource.

Warburton Music Products. “P.E.T.E. Personal Embouchure Training Exerciser.” http://www.warburton-usa.com/index.php/products/accessories/pete (accessed May 11, 2014).

The Personal Embouchure Training Exerciser is a device made by Warburton Music Products. This device is built to help the player exercise the muscles of the embouchure. The P.E.T.E. is designed with two specific exercises in mind. In the first exercise the plate at the end of the device is inserted in the lips and the player pulls gently away. The embouchure muscles engage to hold the device in place. In the second exercise, the pencil-like end of the device is inserted into the lips. The plate on the opposite end acts as a weight and the embouchure muscles engage to hold the device in place.

Watson, Alan. *The Biology of Musical Performance and Performance-Related Injury.* Lanham, MD: Scarecrow Press, 2009.

The Biology of Musical Performance is a thorough exploration of anatomy as it regards musicians in general. Specific concerns towards different musician groupings (string instruments, brass, percussion etc.) are addressed. There is also informative material regarding the ear and hearing related problems of performing artists.

Weinberger, Norman. "The Musical Hormone." *MuSICA Research Notes IV* no. 2 (Fall 1997).

In this article Weinberger presents his findings on the effects of music on cortisol levels. He concludes that music does in fact have an effect on your body's cortisol levels, however, the triggers for this release are dependent upon the person and type of music.

Weinberger, Norman. *MuSica Research Notes Index.* http://www.musica.uci.edu/mrn/subjidx980901.html (accessed May 11, 2014).

Weinberger is a researcher at the University of California who is interested in health related music research. On his index page there is an extensive list of articles he has published pertaining to musician related health topics. These topics are organized by keyword and health relationship. The majority of the research seems to be related to neuroscience, however, the general spectrum is very broad.

Wolfe, Joe. "Brass Instrument (Lip Reed) Acoustics: An Introduction." University of New South Wales. http://newt.phys.unsw.edu.au/jw/brassacoustics.html

This website gives an excellent introduction into the physics of brass sound. The function and effects of the lips, different physical parts of the instrument, and mutes are all addressed.

Wright, Eric. “Dynamic Breathing and Respiratory Mechanics for Brass Players and Teachers,” *International Trumpet Guild Journal* (March 2011): 32-36.

In this article Wright identifies the pedagogical problem created by lack of consistency in the understanding and teaching of how to breathe properly. He goes on to describe the “wedge breath” to be the most dynamic breathing style for trumpet players.

Curriculum Vitae

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Carnegie Mellon University
Advanced Musical Studies Certificate-Orchestral Trumpet Performance
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