Treatment and Prevention of Orofacial Disorders Caused by Playing Brass Musical Instruments and the Connection with Healthcare Providers

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Spring 2014

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Précis

The objective of this study was to research specific injuries caused by the playing of brass musical instruments as well as the preventions and treatments of these disorders. The combination of interest in music and dentistry is the motive for this project. The hope is that musicians and healthcare professionals will become more informed of the playing-related problems since they are often overlooked. The *Brass Instrumentalist/Musician Survey* that was sent out received 70 responses; all of them played the trumpet, trombone, horn, euphonium or tuba. The majority of the respondents were student musicians at a college or university, professional musicians, or music educators, though other occupations did arise for those who recreationally played.

A common theme of prevention for the musicians who took the survey included taking breaks while practicing, not over practicing, varying what is practiced, stopping when tired, stretching, and warming up thoroughly. The following playing-related disorders were discussed in this study: embouchure dystonia, brass poisoning, TMJ disorders, nerve impingements/entrapments, overuse syndromes, orbicularis oris damage, velopharyngeal insufficiency, viral parotitis, and contact dermatitis. The level of awareness of these disorders among musicians was more than expected (66% or less depending on the disorder), but that is still less than preferred. About 25% of the respondents said they had been diagnosed with any of the disorders above and the same 25% had sought out medical help for playing-related injuries in the past.

The view of healthcare professionals by these 16 participants was not an overall positive one. Almost 50% of the people that visited healthcare professionals for a music-
related injury mentioned that the awareness of these problems by healthcare providers was sub-par at best. With this data and data from past studies, it was found that musicians and physicians need to be more informed of these playing-related disorders which are unique to instrumentalists.

Different types of curriculums for injury prevention courses have been designed and suggested by past literature, though presentations at national/international music and physician conferences would be beneficial as well. Another way to make musicians aware of these issues and help prevent them from occurring would be implementation of a warning label/prevention packet system when the instrument is sold. This is not meant to deter people from playing musical instruments, but rather to increase the awareness of potential risks involved with the performing of brass musical instruments.
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Chapter I

Introduction/Literature Review

Everybody has something or multiple things about which they are passionate. They may include reading, exercise, or eating; however, though those things are of interest to many, some are also passionate about performing music. The feeling of sitting at a drum set while playing some upbeat jazz standards with a jazz combo is incomparable. Performing music is a way to express oneself through an instrument, to speak music as a language, to relieve stress, and to forget about reality during that time. Euphoria best explains the feeling for many. A participant of a study done regarding why they were involved in music stated, “music feeds the soul, helps the mind and relaxes” (Park et. al. 2007). Other musicians may participate in music for the social aspects, academic credit, future career goals, or music as part of their identity (Park et. al. 2007).

All these reasons ensure that music stays alive in people and continues to thrive as a career and profession. So what if musicians were not able to play because of an injury or to a playing-related disorder? What if performing as a professional musician was a person’s primary source of income? What if a student musician had to play in an ensemble to receive a grade? What if performing music was the way that a musician was putting food on the table for his family and could no longer play or was forced to take a break from playing due to a playing-related disorder? Though rhetorical, these questions bring to light the significance of playing-related disorders in musicians. Some pain-inflicted musicians have just abandoned their music careers all together because they could not address the problem (Alford, 1996).
Based on a study done where ten professional musicians were interviewed about different disorders that they had obtained from playing, each had different views. All ten had their reasons for playing as well as the varying level of intimacy each had with their instrument. One described it as a “drug that needs to be taken in moderation” (Guptill, 2011). The musicians were asked what they would do if they could no longer play. One of these musicians was told that she would no longer be able to play after an injury she had sustained, and that was devastating for her. Others mentioned they would “lose their identity”, or “it would be hard to not play every day”, or they would “feel empty without music” (Guptill, 2011).

Many might read this and think “there is no way that these issues are very prevalent in the music world;” however, it is quite the opposite. Kok and associates found that in general, there are more musculoskeletal complaints in musicians than non-musicians (2013). In a survey for a professional orchestra, “76% of the professional orchestral musicians reported at least one medical problem that was severe in terms of its effect on performance” (Fishbein et. al. and Middlestadt 1989). In regard to brass instruments, “about 60% of a group of 739 participants reported having one or more musculoskeletal problems related to their playing” (Chesky, 2002). Musculoskeletal refers to muscles or skeletal structure. Based on these numbers, it is of higher prevalence than one might think.

These disorders and problems are actually prevalent enough that the journal, *Medical Problems of Performing Artists*, is devoted to problems of just musicians and artists. In fact, a specialty certification in performing arts medicine has been discussed for a long time among professionals in the field (Manchester, 2013). In another article, Manchester describes how performing arts medicine, though different in some ways, is like sports
medicine and should be evolving in the same manner (2012). It may be helpful to look at sports medicine as the sister specialty. Performing arts medicine, of course, would never reach the caliber of sports medicine mainly because of the lack of memberships and lack of grant and support money to fund such a program (Manchester, 2012).

Though Manchester does mention good points about the direction of performing arts medicine, there have been efforts throughout the last 30 years to increase help for artists and musicians. In fact, injuries in musicians have been documented in the literature since the early 1900s (Pascarelli, 1994). In 1994, a study was done in which all of the performing arts clinics around the country were taken into account and audited. At the time, there were 23 clinics in the country, most of which were affiliated with hospitals and other private clinics (Pascarelli et al., 1994). Each clinic had a variety of specialists such as physiatrists (rehab physicians that deal with movements), neurologists (treats diseases of the nervous system), internists (internal medicine), psychiatrists (treatment of mental illness), otolaryngologists (treatment of the ear, nose and throat), orthopedists (treatment of skeleton and associated structures), osteopaths (treatment of bones, joints, and muscles through alternative methods and manipulation), and rheumatologists (treatment of arthritis). Former professional musicians would also work in these clinics. Even with all of the expertise in the clinics, it was difficult to justify the need for a specialty clinic when the average amount of patients that come to each clinic is about 15 per month (Pascarelli et al. 1994).

There are possible explanations for why patients may not be going to these much needed clinics. “Musicians are generally poorly paid, independently contracted, and lacking timely, affordable access to healthcare” (Guptill, 2011). Another reason may be that
musicians have a culture of silence when it comes to music related injuries. One participant was actually stigmatized because of her injuries. She said, “All of my friends quit calling me. I’d go and sit in orchestra rehearsal and I’d cry” (Guptill, 2011). Others mentioned that injury would possibly hurt the chances of getting hired. This stigmatized and negative mindset towards musicians’ injuries is something that should be changed and can be changed at a very young age if the right steps are taken. What can be done about these issues?

The orofacial playing-related disorders caused by brass instruments that were studied in this project included: focal/embouchure dystonia, brass poisoning, TMJ disorders, nerve impingements/entrapments, overuse syndromes, orbicularis oris damage, velopharyngeal insufficiency, viral parotitis, and contact dermatitis. Dr. Altenmuller and Dr. Jabusch stated that focal dystonia is a task-specific movement disorder that is characteristic of muscular incoordination loss of voluntary motor control while the musician is playing the instrument (2010). Some sources suggest anywhere between 5-13% of musicians suffer from focal dystonia depending on the author (Lie-Nemeth, 2006). Brass poisoning can occur when the silver/nickel plating on a brass mouthpiece is worn off and there is direct skin contact with the underlying brass. The copper component of brass is what causes the problem and could be characterized by swelling of the area, anemia, chills, burning sensation, fever, diarrhea, liver failure, metallic taste, muscular aches, vomiting and yellow skin among others (medlineplus).

Temporomandibular joint problems are more prevalent in brass instruments than other wind instruments because of the protrusion of the lower jaw while playing (Leo et al., 2002). It can include pain in the face, jaw or neck, stiffness, lock-jaw, painful clicking or
Nerve entrapments can also be caused by brass instruments and are characterized by a compression or pinching of a nerve either from external forces or by bone spurs or thickened ligaments and the symptoms can include pain, numbness, cramping, and impaired dexterity (for hand problems) (Lederman, 1986). Based on the survey, nerve entrapments were uncommon in the orofacial region, but there were multiple mentions of nerve impingements in upper limbs and back caused by musical instruments (Liu et al., 2002 and Lederman, 1986).

Dr. Lederman described the rupture of the orbicularis oris muscle as being caused by the high pressures and overactivity of the muscle (2001). Another issue is velopharyngeal insufficiency which is when there is no separation between the oral cavity and nasal cavity which causes air to involuntarily go through the nasal passage because of the lack of the development of the soft palate (medscape.com). Viral parotitis was mentioned in an article and it is when there is high intraoral pressure caused by playing a brass instrument which can force saliva into the parotid salivary gland which can result in a bacterial infection (Howard et al., 1989) or viral infection if viruses are in the area (Brook, 1992). The last disorder studied was contact dermatitis which is any irritation or allergic reaction to an instrument (Howard et al., 1989) which means that brass poisoning is an example of contact dermatitis.

The goal of this project is to research specifically the types and prevalence of orofacial disorders that occur from playing brass instruments, such as the trumpet, trombone, horn, euphonium and tuba. The study will also expand on what treatments and preventions could be done to help prevent such disorders from even occurring in the first
place and how the education of musicians and music educators can help with this. The study will also look into the connection of all of this with healthcare providers.
Chapter II

Thesis Activity/Research Question

What are the most significant musculoskeletal and nervous system disorders that arise in the mouth and surrounding areas of the face due to the playing of commonly known brass instruments? In addition, are there any prevention’s for such disorders or are there ways to treat those disorders? Finally, how can cautious measures be taken to prevent any injury that may occur in professional and amateur musicians?

Limitations of this study

This study will be limited to problems associated with the playing of brass instruments. Problems related to the playing of woodwind instruments, percussion instruments, and piano will not be considered. Furthermore, only the brass playing problems associated orofacial disorders will be considered. Any other problems (e.g. hernias or vertebral issues) will not be addressed in any sort of detail in this study. The link between orofacial disorders, brass instruments, and occupation (other than musician) will not be discussed in detail in this project, but could be a different angle of research in future studies.
Chapter III

Methodology

A thorough literature review encompassed injuries and disorders that dealt with every instrument. This search was narrowed to just disorders from playing brass musical instruments. Many articles were found mainly through *Medical Problems of Performing Artists, Science and Medicine* and *Pubmed*. A vast amount of articles were studied/reviewed regarding performing arts medicine and its history, as well as treatments, preventions, music in healthcare and many articles regarding the specific disorders that were being studied such as focal/embouchure dystonia, brass poisoning, TMJ disorders, nerve impingements/entrapments, overuse syndromes, orbicularis oris damage, velopharyngeal insufficiency, viral parotitis, and contact dermatitis.

Based on the research of these topics, a list of questions was formulated for a couple surveys that were named *Brass Instrumentalist/Musician Survey* and *Healthcare Professional Survey*, both of which were sent in for IRB Approval/Exemption and it was successfully approved. Contact was made to different members at the ITG (International Trumpet Guild), ITA (International Trombone Association), ITEA (International Tuba Euphonium Association), and IHS (International Horn Society) as well as a few healthcare groups such as the ADA (American Dental Association), AAOMS (American Association of Oral and Maxillofacial Surgeons) and AAO (American Association of Orthodontists). The website “surveymonkey.com” was used to make the surveys for a one time month long charge of $24. The custom surveys were made and a web URL address was posted onto the Facebook pages of the ITG, ITA, and ITEA groups (IHS would not allow it) by suggestion
from the contacts at each organization in hopes of reaching a good number of brass instrumentalists. Along with the survey link, there was a brief elaboration on the goal of this particular study so that they were informed of what they were choosing to participate in or not. There was not any luck with the Healthcare Professional Survey since two of the three Facebook groups could not be posted on by the public, and only one response to the survey was received while it was open. That being said, the healthcare survey was dropped from the data collection and this study focused solely on the data and answers collected from the Brass Instrumentalist/Musician Survey which gathered more than fruitful results. Since it was put out on Facebook and was completely volunteer-based, choosing to participate in the study assumed consent.

The following questions were asked on the Brass Instrumentalist/Musician Survey and a sample copy of the actual survey dispersed is in the Appendix.

- Sociodemographic information
- What brass instrument they played and for how long
- Their occupation
- Any injuries from playing
- What type of healthcare professional they sought help from
- If they had “heard of” or been “diagnosed with” any of the disorders that were mentioned above in the methodology
- Any treatment and preventions that the healthcare professional prescribed
- If the musician had any preventative techniques that they practiced
- How helpful the healthcare professional was at explaining their medical condition
• Was the healthcare provider aware/knowledgeable of instrument playing-related disorders

There was a compilation of the information and which was analyzed on surveymonkey.com and the answers were compared with past literature as well as new ideas were formulated.
Chapter IV

Results and Discussion

Brass instruments, as mentioned before, are instruments that include trumpet/cornet, trombone, horn, euphonium and tuba. Other wind instruments may include clarinet, saxophone, and flute; however, those instruments were not focused on in this project. Trumpet, trombone, euphonium, and tuba mouthpieces are all similar, just different in size. Horn mouthpieces are a more elongated shape as seen in the picture below. Mouthpieces for brass instruments are made a specific way. They are made of brass which is plated with silver, gold, nickel, or some other metal.

The picture to the left shows the five main brass instruments that will be studied in this project. On the top left is the trumpet. Directly below that from the left to right are the horn, euphonium, and tuba, and on the bottom is the trombone. Of course, these instruments may look different depending on the finish and style; however, this is a general overview of what they look like.

To correctly play a brass instrument, air must be blown through the mouthpiece with the correct embouchure. Farkas had a great way of explaining embouchure, “the mouth, lip, chin and cheek muscles, tensed and shaped in a precise and cooperative manner, and then blown through for the purpose of setting the air-column into vibration
when these lips are placed upon the mouthpiece of a brass instrument” (1962). There are also sets of valves or a slide (trombone) to help change the tones and pitches played. Tones are generated in brass instruments as a result of the self-sustained oscillation of the lips of the player (Elliot, 1982).

Though many may think that playing a musical instrument is easy, musical performance is a physically and emotionally demanding process (Baadjou et al. 2011). It can be physically taxing especially over the period of a musician’s lifetime. In fact, since playing a brass instrument on a daily basis for upwards of 5 hours a day is normal for a professional musician, the repetitive force on the head, mandible and facial muscles may result in malocclusion and other deformations of the stomatognathic system (Glowacka et al., 2014). Malocclusion refers to the misalignment of the teeth in the upper and lower jaw leading to an incorrect or crooked bite. Stomatognathic system refers to the mouth, jaw, and other nearby structures (Cuccia, 2009). Dentists, maxillofacial surgeons and ear-nose-throat doctors all help treat diseases in this area.

The prevalence of medical problems in brass musicians is higher than expected. According to Dr. Chesky, his associates and past studies, “76% of orchestral brass players reported at least one medical problem severe enough to affect performance, and 87% of college students and 56% of high school brass players experienced performance-related pain” (2002). Dr. Lederman mentioned that very little attention has been paid to embouchure problems in instrumentalists, including brass players, in the performing arts literature (2001). Though that may be true, vast amounts of information was collected in this study regarding different types of embouchure related problems caused by brass instruments. Dr. Rodriguez-Lozano and associates mentioned some issues that can occur in
musicians: overuse syndromes, peripheral nerve compression syndromes, functional
dystonia and others (2011). Details of the survey will be covered next while also combining
the bulk of the information that was found regarding different disorders in the literature.

The name of the survey was Brass Instrumentalist/Musician Survey. There were 70
responses for the survey, which was a decent sample size for this type of a project. Based
on past studies, other experimenters/surveyors numbers ranged from around 100-800
responders/individuals. The demographic breakdown of the survey was quite expansive,
which added a lot of depth to this project. About 40.58% of the people surveyed were
between the ages of 18-24, another 39.13% were between the ages of 25-34, and the other
~20% was spread out between the ages of 35-74. Age is important for this study since it
can help determine the possible time of onset for different injuries or determine if age is
even a factor. About 75% of the people who responded were male and about 25% were
female. Knowing the gender can help link the injury to a possible genetic disorder and can
determine if it can be passed on to subsequent generations.

By posting the link for the survey on the international instrumental Facebook
groups for ITG, ITA, and ITEA, people from different states and countries were reached.
Responses were received from individuals from Australia, Germany, Thailand, Canada,
Republic of Georgia, and the rest were from the United States. Understanding the location
of individuals could possibly link an injury to a predisposed environmental factor, though
very unlikely for this study. Respondents that resided in the United States lived all over the
country, including: Washington, Wisconsin, Oklahoma, New York, Kentucky, Georgia,
Illinois, Texas, Ohio, Florida, Missouri, New Jersey, Minnesota, Idaho, South Carolina and
Maryland.
The current occupation/job was also inquired of respondents. In contrast to other articles, there was no segregation or limitation based on occupation. Most of the articles interviewed/surveyed strictly professional, amateur, or student musicians to gather data. This is limiting because it does not open up the possibility that a musician may have had to quit playing due to an injury and thus was not accounted for in the study or survey pool. By limiting the pool to just professional musicians or student musicians, it leaves out the possibility that the injury could have been induced by a predisposed problem, like stress, lack of sleep or another job. Though not by choice, the survey was opened up to people that may have not been professional or student musicians, but chose to play recreationally, which adds an extra element that was excluded in other studies. The link between orofacial disorders, brass instruments, and occupation (other than musician) will not be discussed in detail in this project, but could be a different angle of research in future studies. Staying consistent with the ~40% between the ages of 18-24, the majority of the respondents were student musicians. However, other occupations included: academic administrator, university professor, professional musician, technology director, teaching assistant, office drone, data analyst, logistics planner, security cooperation officer, project manager, mechanical engineer, and many music instructors. Asking about the occupation may give insight into other links for these injuries.

The respondents were asked which brass instrument they played, how many years they have played that instrument and the average amount of hours played per week. These results are shown in the figures below.
Figure 1: Primary Brass Instrument Played by Respondents.

Note: 32 people that responded played tuba/euphonium (aka low brass), 14 played trumpet, 19 played trombone, and 5 played horn.

Figure 2: Years Instrument Played.

Note: Most of the respondents had played from anywhere between 5-20 years at the time of taking this survey.
Figure 3. Hours Instrument Played Per Week.

Note: Most of the respondents played from anywhere between 0-20 hours a week, though about 6 played for upwards of 40 hours a week. Since this survey was on a Facebook group, there was an option for “used to play, but do not anymore.” Their data was counted just the same.

The respondents were then asked if they had experienced any problems/injuries that arose from the playing of their primary brass instrument that resulted in needing to seek medical help. Of the 70 that participated, 62 answered this question (8 skipped it), and of those 62 that answered, 25.81% (16/62) of them indicated that they HAD experienced problems that led them to seek medical attention. 74.19% (46/62) of the respondents indicated they had not experienced any issues. Out of the 62 people that answered this question, 16 of those had experienced problems that arose from playing their brass instrument and led them to seek medical help. This adds to the significance of this topic. 25.81% also is about half or less as much prevalence than seen in other studies; however, it is still significant.
The structure of the survey helped narrow down the individuals who had experienced playing-related issues, though others who had not experienced issues were also included so that modern prevalence of these problems could be taken into account. If the respondent answered “yes” to having experienced playing-related injuries, they were asked to briefly elaborate in a comment box that followed. Some of the issues did not have to do with the orofacial structures such as: back issues, wrist injury, hand injury, finger problems and arm pain. These comments were not taken into account in the analysis since they did not fall into the orofacial disorder category; however, they add to the percentage of musicians that deal with injuries in general.

The next question was “what type of healthcare professional did you go to when seeking help? Check all that apply.” All 16 that answered that they had experienced an injury/problem from playing their brass instrument said that they sought treatment from one or more healthcare professionals. This means that 100% of the musicians injured (despite if it was orofacial or not) sought out help from a medical professional. This is important because it directly contradicts the statement from Guptill that said musicians shy away from going to seek help because it is stigmatized or they cannot afford it (2011). This fact means that musicians are becoming more honest with themselves when problems arise and seek help despite what other people might think of the problem.

The following graph indicates different healthcare professionals from which the injured musicians sought help.
Figure 4: Type of Healthcare Professional Sought After for Help

Figure 4 raises many interesting points. First of all, the Performing Arts Medical Clinics employ various specialists (Pascarelli et al., 1994); however, based on the survey results, most of the injured musicians (10/16) sought help from their Primary Care Practitioner. This could be a reason that there are so few visits per month at these Performing Arts Clinics. Pascarelli actually expanded on this and mentioned that it is hard to market and get patients into a Performing Arts Clinic, even in larger cities (1994). This may be a result of the lack of knowledge that the clinic is even there, lack of clinics in the surrounding area in which the musician lives, or the cost of specialized help. This, of course, brings up quite the vicious dichotomy: the musicians do not make enough money to seek specialized help, or choose not to according to various reasons as stated by Guptill and Pascarelli, and the clinics need the patients’ (insurance companies) money to stay open to help the musician population with their specialized needs. Pascarelli mentions that the
clinics need to market themselves to younger musicians to try and make musicians aware of the existence of Performing Arts Medicine (1994).

Another interesting statistic based on Figure 4 is that some of the respondents sought help from more than just one healthcare professional. Four of the respondents sought after more than one healthcare professional, three sought after more than two, and one went to five different healthcare professionals for problems from playing their instrument. However, the 16 that answered yes to having issues in the first place had multiple complaints which may have required different medical specialties.

The participants were then asked whether or not they had heard of or been diagnosed with (two separate questions) any of the following disorders that can be considered to be playing-related problems: focal/embouchure dystonia, brass poisoning, TMJ disorders, nerve impingements, overuse related problems, damage to the orbicularis oris, velopharyngeal insufficiency, viral parotitis, contact dermatitis, or other. There was a short 4-5 word description of what each disorder was next to the disorder to ensure ample understanding. There were only 62 of the 70 participants that answered the “heard of” question and 58 of the 70 that answered the “diagnosed with” question and so the percentages were based off of those numbers. The following figure depicts the knowledge that brass musicians have of the playing-related problems mentioned above.
The amount of people that are even aware of or that had even heard of these disorders is shockingly high compared to what was thought it would be. At most, 66.13% of the respondents to this question had heard of focal dystonia. About 64% had heard of overuse-related problems in general, and another 60% had heard of TMJ Disorders. About half had heard of damage to the orbicularis oris and brass poisoning, and then the numbers decline to 43.55% of respondents who had heard of contact dermatitis. Less than a quarter of the respondents knew what the rest of the disorders listed were. These numbers are difficult to compare to other studies since other studies address this topic in a different manner, but based on my numbers, it seems that there is still a lack of awareness of the problems that can arise from playing a brass musical instrument, despite the description of each disorder.

There was a follow up question on the survey to see if any of the participants had been diagnosed with any of the listed conditions. Of the 58 that answered this question (as
"none of the above" was also an option so that all would still answer) 15 said that they were diagnosed with one or more of the conditions. The individuals with these disorders will be discussed in detail in the following paragraphs “case-study” style with the known information and what was found in the this survey.

Out of the 15 that said they had been diagnosed with one or more of these conditions, 1 stated having been diagnosed with focal/embouchure dystonia. Dr. Altenmuller and Dr. Jabusch do a great job of describing focal dystonia, “Focal dystonia in musicians, also known as musician’s dystonia or musician’s cramp, is a task-specific movement disorder that presents itself as muscular incoordination or loss of voluntary motor control of extensively trained movements while a musician is playing the instrument” (2010). Focal dystonia and musician’s dystonia are interchangeable and refer to the loss of motor control of any body part; however, embouchure dystonia refers to just the loss of motor control of the lips and parts of the face involved in the embouchure as discussed before. Embouchure dystonia affects coordination of the lips, tongue, facial and cervical muscles (Altenmuller et al., 2010).

Focal dystonia has been an issue in musicians since before the Medical Problems in Performing Artists journal came into existence in the 1980s, and it has continued to show up in articles for the last 30 years. According to Altenmuller and his associate, about 1% of musicians suffer from focal/embouchure dystonia (2010). Other sources suggest anywhere between 5-13% of musicians suffer from it depending on the author (Lie-Nemeth, 2006). This is consistent with the numbers obtained in the study since 1 of the 15 had been diagnosed with embouchure dystonia. Altenmuller also mentioned that brass instrumentalists are at higher risk of acquiring focal/embouchure dystonia than other
musicians such as piano, vocal, or other (2010). The symptoms of focal/embouchure dystonia include impaired control, stiffness or cramping, involuntary movement, pain (not always), fatigability, tremor or jerking, loss of lip seal, and weakness (Lederman, 1991). As a musician who is trying to make a living as a professional, any of these symptoms can cause many problems in a performance, which can lead to loss of a job. Also, most musicians see focal dystonia as a flaw or a technical problem in their playing and tend to practice more to fix it, which in turn amplifies the issue (Altenmuller, 2010). In contrast to Lederman’s list of symptoms, Dr. Lie-Nemeth found that pain was not usually associated with dystonias, which would coincide with why musicians do not initially seek help for this issue (2006). Until recently, scientists did not know what caused focal dystonia, but it had been linked with overuse of muscles, a sudden change in playing style or increase in the amount of playing time, a central nervous system problem, or stress, among other things (Hallett, 1999). Just this year, in 2014, new advances in the understanding of focal dystonia have been discovered. I. M. Skogseid found that there were two gene mutations causing primary generalized dystonia (DYT1-TORIA and DYT6-THAP1) (Skogseid, 2014).

The individual that had been diagnosed with focal dystonia mentioned he was a music teacher in Georgia, and during 3-4 years of his playing career in graduate study, he experienced limited playing ability due to this disorder. He said “the three years I spent with limited playing ability were some of the most frustrating years of my life,” which is not surprising since this disorder can cause people to change careers. He mentioned that he played with too much tension in his lips and neck. This in turn erodes and fatigues the muscles that govern your embouchure, and thus those muscles are left confused and unable to operate. He had to change his approach to playing his horn altogether, which
consisted of not only warming up and down properly, but also focusing more on the wind that he produced rather than the muscles in the embouchure. “The less I rely on those muscles, the less tension I play with” he said, which in turn leads to less chance of issues. Other victims of focal dystonia, including David Vining and Peter W. Iltis, talked about similar instances of this issue and the ways that they overcame it over the years using different styles and therapies (Iltis, 2011 and Vining, 2010). Since it is now known that dystonia is caused by gene mutations, it is unclear as to whether or not it can be treated or prevented by these methods. Only future studies will be able to tell; however, it seems that the respondent was able to reduce the symptoms of his embouchure dystonia by changing the way he played and thought about his instrument.

Current treatments for embouchure dystonia include anticholinergic drugs like trihexyphenidyl, botulinum toxin (BOTOX), along with rehabilitation techniques (Altenmuller, 2010). BOTOX is used in plastic surgeries. It inhibits nerve actions and feelings, which could be detrimental for a musician. Skogseid mentioned that new advancements in BOTOX and deep brain stimulation (DBS) have revolutionized the symptomatic treatment for dystonia, though it needs to be refined in future years. He also talks about how oral medications have not yet improved to the point of helping with dystonia (2014). Since there are still limitations on treatments, it is imperative to take precautions and practice proper preventions such as warming up and stretching before playing to help reduce focal dystonia flare ups (Altenmuller, 2010). Hopefully in future studies and trials a successful treatment will be found which will relieve all the symptoms of focal dystonia. Though there is promising results with BOTOX, new techniques may benefit more as future research is done.
Another problem that can arise from playing a brass instrument is brass poisoning. Whilst researching this topic online, many forums were found with people posting and asking whether brass poisoning was an actual thing or just a myth. For example, on one forum, user by the name of ‘tarhealer’ said, “I've been euphing (playing euphonium) for a few years in a couple of community bands. Other brass players have looked at my old mouthpiece (which has been around long enough to have lost much of its silver plating) and advised me to get it re-plated lest I come down with something called "brass poisoning." Not being able to find anything on the internet about this supposed malady, I’m beginning to wonder if it actually exists” (Dwerden, 2008). Brass poisoning is definitely an issue, though the problem actually lies within the components of brass.

As mentioned before, brass mouthpieces are made of brass and are plated with a different metal such as gold, silver, or nickel. Brass is actually an alloy of copper and zinc. The so-called “brass poisoning” actually is caused by the copper component of the brass. Problems arise once the plating on a mouthpiece is worn off, though some people can have a nickel allergy which will be covered later. Since copper is a component of brass, copper toxicity can occur once the plating comes off. Overexposure, such as touching too much copper can cause symptoms such as: swelling of the area, anemia, chills, burning sensation, fever, diarrhea, liver failure, metallic taste, muscular aches, vomiting and yellow skin among others (medlineplus). As a musician, since the problem usually accumulates over a long period of time, the level of danger of the issue depends on the damage that has been done to the organs (medlineplus). This issue cannot be acquired overnight as a musician. So when skeptical musicians ask about brass poisoning, it is an issue that accumulates over
time unless the musician has an acute reaction to it which would mean they are allergic to brass/copper.

One individual that took the survey that said she suffered from a brass/silver allergy. She mentioned that the healthcare provider prescribed skin cream to help with the issue. She was one of the 16 respondents that sought help from a healthcare professional. According to Medlineplus, the patient with acute copper poisoning may receive activated charcoal, an emptying of the stomach, dialysis, or medicine to reverse the poison, however, long-term poisoning can attribute to liver failure. Musicians with nickel allergies can also have similar issues. They can have eczema in the lip, but this can be addressed by switching to a plastic mouthpiece or different metal plates (Liu et al., 2002). Eczema is a general term referring Essentially, if musicians have a mouthpiece in which the plating has worn off, they should get it re-plated, replaced or try a new mouthpiece type such as plastic or wood. In addition, if the brass musician is allergic to the plating, (e.g., nickel or silver allergy) then the musician could get the mouthpiece re-plated with a different metal or they could try a plastic or wood mouthpiece.

Temporomandibular joint disorders (TMJ disorders) can also arise from playing brass instruments. As Leo and associates said, TMJ problems are more prevalent in brass instrumentalists because of the protrusion of the mandible (lower jaw) during playing (2002). TMJ is a combination of problems that causes pain and dysfunction in the jaw joint. It can include pain in the face, jaw or neck, stiffness, lock-jaw, painful clicking or popping when opening and closing, and a change in the occlusion of the teeth (nih.gov). TMJ disorders can be caused by a myriad of activities, one of which is playing a brass
instrument because of the constant protrusion of the mandible and the pressure that the brass instrument puts on the joint.

Three of the respondents said that they had been diagnosed with TMJ. One described that the orthodontist had her wear a retainer, and if that did not work, then either stop playing or consider surgery. As we found in Guptill’s study, quitting would be like losing a part of yourself or like losing your identity, so that was not an option for her. Another respondent said that her family practice doctor had her wear a mouth guard which would relieve some of the pressure of the instrument on the joint. The third participant said that he had visited multiple health providers including a physiotherapist. He had his TMJ treated with splints and small build ups on the back teeth to correct his bite. He also had cranial chiropractic sessions, which would probably be painful. Some different ways that the NIH suggests to prevent TMJ disorders are to eat soft foods, avoid extreme jaw widening (yawning excessively) which adds to the clicking sounds, and practice gentle jaw stretching and relaxing exercises. Different kinds of splints or dental appliances may be prescribed in extreme cases.

Playing brass instruments can also cause nerve entrapments/impingements. According to Dr. Lederman, nerve entrapments/impingements are caused by a compression or pinching of a nerve either from external forces or by bone spurs or thickened ligaments and the symptoms can include pain, numbness, cramping, and impaired dexterity (for hand problems) (1986). An example is the acute compression of “funny bone” by accidentally hitting your arm on a counter. Of the 16 participants that said they sought medical help, one mentioned being diagnosed with nerve impingements, but he did not go into the details of the treatment or preventions that the doctor prescribed.
Taking time from playing the instrument would let the area rest and could help relieve the pain, as well as taking aspirin for minor cases. Brass players may have to change their embouchure to stop the problem from recurring, which for many can take a long time, especially for a professional who has used the same embouchure for many years. For more major cases, steroid injections or narcotics could be used to help reduce pain and swelling (webmd.com). Based on the survey, nerve entrapments were uncommon in the orofacial region, but there were multiple mentions of nerve impingements in upper limbs and back caused by musical instruments (Liu et al., 2002 and Lederman, 1986).

Overuse related problems such as back pain or torn muscles can be caused by playing brass instruments. Liu and Hayden described overuse syndrome as any tendinitis, tenosynovitis, dystonia, and are caused by excessive or unaccustomed use and is characterized by pain and loss of function in muscle units, and are manifested by weakness, loss of control (accuracy), and loss of agility (speed) (Liu et al., 2002). According to my survey results, of the 16 that had experienced symptoms that needed medical help, only 3 indicated that they had experienced overuse syndrome. One participant said that acupuncture helped along with rest. Another described his overuse as back pain, which was not in the orofacial region. The third person also described years of problems due to embouchure dystonia, a type of overuse problem. Along with ibuprofen and taking time off, he had to completely change the way he thought and played the instrument. Since there are many things that fall under overuse syndromes, there are also many treatments and preventions.

Damage to the orbicularis oris can be devastating for brass performers. The orbicularis oris is the muscle that makes a circle around the lips and is essential for
performing any wind instrument. Lederman described the rupture of the orbicularis oris muscle as being caused by the high pressures and overactivity of the muscle (2001). Another name for this problem is “Satchmo’s Syndrome” and it could be treated surgically or with long periods of rest so it can heal (Liu et al., 2002). Liu and Hayden also mentioned that the famous trumpet player of the 1930s, Louis Armstrong, had to take a year off in 1935 because of a ruptured orbicularis oris (Liu et al., 2002). Satchmo was a nickname for Louis Armstrong and thus, the syndrome was named after him. Louis Armstrong was a virtuoso trumpet player that revolutionized jazz for African American musicians in the 20’s and 30’s.

There were two respondents of my survey that said they had been diagnosed with damage to the orbicularis oris muscle. One mentioned that acupuncture was helpful for the extreme upper lip pain and that rest and vibrations were a good prevention technique. The other tore his orbicularis oris muscle and had to get it surgically repaired. There are always different severities of this issue, however, these are good examples taken straight from the survey.

Velopharyngeal insufficiency is another issue that can arise from playing brass instruments. Velopharyngeal insufficiency, in general, is when there is no separation between the oral cavity and nasal cavity which causes air to involuntarily go through the nasal passage because of the lack of the development of the soft palate. Because of this, some people are predisposed to this issue, such as cleft palate surgery patients (medscape.com). In the terms of brass musicians, this occurs when the brass player’s blow into their instrument and some of the air goes into the nasal cavity. This seems harmless; however, it can be detrimental to a musician’s career and could even end their career.
Schwab goes on to say that most musician’s that acquire this issue are young musician’s aspiring to be professionals and they think of it as an operating error or even use it to their advantage (2004). According to my survey, nobody had been diagnosed with this disorder. In addition, only about 25% of respondents had even heard of it. This contradicts the level of awareness that Schwab’s study found. He found that at least 65% of brass instrumentalists were aware of this issue and his sample size was larger (Schwab et al., 2004). This discrepancy is probably caused by the small sample size as well as the fact that a lot of the respondents were student musicians and had probably not encountered something like this, though the most likely onset is in young musicians, as Schwab said (2004). An examination by an ENT should be administered to determine the best course of action for musicians with this issue (Schwab et al., 2004). An ENT is an ear, nose, and throat specialist.

Viral parotitis is also a playing-related injury. The high intraoral pressure caused by playing a brass instrument can force saliva into the parotid salivary gland which can result in a bacterial infection (Howard et al., 1989). It can also sustain a viral infection if mumps, influenza, or other viruses are in the area (Brook, 1992). Brook goes onto explain that some predisposing factors can cause it such as dehydration, malnutrition, and medications that diminish salivation (1992). None of the respondents said they had been diagnosed with viral/bacterial parotitis, and hardly any of the respondents (2/62) had even heard of it. There was not much information in the literature about prevalence among musicians other than it can occur in some cases.

Contact dermatitis is another problem that can arise. Contact dermatitis is the irritation or allergic reaction of the skin due to some substance such as nickel or long term
contact with alloy materials (Howard et al., 1989). Brass/copper allergy could fall under the category of contact dermatitis as well. According to Gambichler and associates, skin conditions, such as contact dermatitis is a prevalent issue in musicians of all ages and calibers (2004). Symptoms can include acne breakouts, irritation and redness of the area (Howard, 1989). According to the survey, 2/16 of the respondents that sought medical help said they had been diagnosed with contact dermatitis. One respondent did not elaborate on this dermatitis case. The other respondent also was diagnosed with brass poisoning and TMJ at some point along with contact dermatitis. To help treat this irritation, skin cream was prescribed. Trying a titanium platted mouthpiece may also be a solution (Giddings, 2014).

Since the majority of the respondents to survey (about 75%) had never encountered any issues from playing their instrument, a follow up question was “if you have not experienced any playing-related problems, what have you done to help prevent these issues from occurring?” 36 participants answered this question and the answers included: warming up properly, stretching often, taking frequent breaks, use of ergonomic straps to increase comfort and decrease stress on a part of the body, good posture, have body awareness, and rest when fatigued. Answers pertaining to the orofacial region specifically include: stop playing or take a break when lips begin hurting, avoid intense pressure from mouthpiece, clean mouthpiece after ever session, and take time off when lips feel taxed. Most of these of course were preventions seen in most of the disorders above and also coincide with the seemingly simple list of prevention methods set up by Zaza. Zaza found that practicing with these components will help prevent problems: warm-up, breaks,
pacing, vary playing content, cognitively rehearse, exercise physically, understand the anatomy of playing an instrument, and manage stress and anxiety (1994).

The participants were asked two more questions regarding healthcare professionals. The first was “how helpful was your healthcare provider at explaining your medical condition(s)?” Both healthcare questions were geared toward those who had sustained injury in hopes of gathering information on the relationship between physicians and musicians; however, there were 28 participants that answered this question because it was open for everyone to answer which means that some participants (about 12) had went to seek help from a healthcare provider for a problem or is basing their answer on their opinion of the healthcare provider without any basis. Therefore, the 12 participants were cut out for consistency, thus leaving 16 responses which were how many participants had said they had sought medical help in the first place. Nevertheless, 2 said the healthcare provider was extremely helpful, 2 said very helpful, 6 said moderately helpful, 4 said slightly helpful, 1 said not at all helpful and 1 said N/A. The one that said N/A was seen by a drum corps medic and they probably didn’t see them as their actual healthcare provider.

The last question gave an agree/disagree question that read “your healthcare provider was aware/knowledgeable of instrument playing-related disorders in general” then the choices were strongly agree, somewhat agree, neutral, somewhat disagree, strongly disagree and N/A. Of the 56 participants that answered this question, 35 said N/A (probably because they have not encountered problems while playing a brass instrument) the rest are shown distributed in the figure below. This left 21 responses, 16 of which were chosen to make the figure below since, again, they were the original 16 that sought medical help in the first place.
Figure 6. Awareness of Playing-Related Disorders by Healthcare Providers.

Note: Strongly agree-1, somewhat agree-4, neutral-3, somewhat disagree-6, strongly disagree-1, N/A-1. The person that responded N/A also was the drum corps responder for the previous question.

This figure is significant because from a musician's perspective, this indicates that almost 50% of the responders (7/16) somewhat/strongly disagreed with the statement “your healthcare provider was aware/knowledgeable of instrument playing-related disorders in general.” Also, if neutral is included in the numbers, almost 63% of respondents do not agree that healthcare professionals are aware of disorders caused by brass musical instruments. Along with that, 11 out of the 16 respondents thought that at most the musicians thought that the healthcare professionals were only moderately helpful or less. This is worrisome because this means that musicians do not feel confident that their healthcare provider knows the necessary information or has the background to help with the specialized needs of musicians. This is consistent with Yeo and associates who said that “career musicians express reluctance to attend dentists who are not sensitive to
their specific needs” as musicians (2002). Of course, that could be said for any healthcare professional since not every person with an orofacial problem is going to go to the dentist for help.

Communication between any patient and their healthcare provider should be very thorough and clear since in some cases, the patient’s life depends on it. For musicians, the fact that they play an instrument should be mentioned up front when talking with a healthcare provider. Howard and Lovrovich suggest musicians tell their healthcare providers about their musical activity and bring in their musical instrument to demonstrate (1989). If the musicians take it upon themselves to tell the healthcare provider, it would at least get the provider thinking about the issues since physicians are often unaware of the disorders that can arise from playing a musical instrument (Burkholder et al., 2004). On the contrary, Park and associates believe that healthcare providers should be informed already and take the initiative in informing the musician patients of the problems that can arise from playing their instruments (2007). This would require a level of understanding on both fronts: musicians and physicians. One solution that seems quite obvious is that when there are conferences throughout the year, there needs to be a presenter that presents findings and information in the form of a literature review report to inform the musicians/physicians. There are the Medical Problems of Performing Artists Journal and various medical journals for various types of doctors; however, is the information actually getting distributed well-enough to make an impact? Based on the survey, many musicians do not know about disorders that have been in journals for 30 years, so maybe a conference presentation would be more beneficial.
Another view is that the music-teacher is the key player and essentially the gatekeeper between the music student and healthcare provider and they play a huge role in guiding the musician (Quarrier, 1995). This is consistent with the thoughts of Zaza who explains that the music teachers should be educated and should incorporate preventative techniques in private lessons and classrooms (1993). Zaza then goes onto explain that the music social and educational environment would be more open and less stigmatized if teachers, students, and administrators were more educated about musical disorders in general which would then lead to a positive outlook on musical injuries (1993). Since the music teacher is most likely the person that the student will approach about a problem, it only makes sense that though healthcare providers should have a background in these issues, music teachers should have a more in depth understanding of the problems that can arise since, after all, music is their life and they should be experts on every aspect of their instrument, including potential risks of playing it.

A way to inform music teachers, or better yet, students (since some university students become music teachers/professors) of the potential risks and problems associated with musical instruments, is to create a class and include it in the curriculum. Adding this type of class was suggested multiple times in articles (Zander et al., 2010 and Lopez et al., 2013). In fact, Lopez and his associates implanted a course to see if musicians who took the class would become more aware of musical injuries and would practice more preventative techniques and after 12 months, the experimental group improved body awareness by 91% and the frequency of injuries decreased by 71%, and there was no improvement in the control group (Lopez et al., 2013). This study was done in 2013 and was the first of its type. While searching on google.com to see if schools in the United States
had already incorporated a “musical injury” type class into their curriculum, it was shocking to see the first hit was a 1-credit class titled “Prevention of Music-Related Injuries Course” offered at Ithaca College in New York (Ithaca.edu) starting in Fall 2014. The professor for this course is Nicholas Quarrier and he wrote one of the papers that was used as a source for this project. The cycle of educating musicians of playing-related injuries has to start somewhere and if there are professors teaching this subject, even as an elective, it will do wonders for the musicians of the future generations—be it music students, teachers, and administration alike.

Though a class curriculum has been laid out by Dr. Susan Arjimand in an article from 2009, there are more ways to educate musicians of these issues. One contention is that a warning label system on musical instruments and mouthpieces would be beneficial. A warning label in the form of a pamphlet, sticker, or small packet could help. For example, a new trumpet mouthpiece package could read, “CAUTION: DO NOT USE this mouthpiece if the silver/nickel plating has worn off as brass/copper poisoning could occur over time or cause an acute allergic reaction. In addition, DO NOT USE if irritation or rash occurs on skin or lips after playing your trumpet—this could mean you have an allergy to the silver/nickel plating.” Something that is simple, yet informative could save someone from inducing an allergic reaction. Another example could include a pamphlet that comes with the brass instrument that states the most prevalent problems that could come from playing the instrument. A third possibility could be to add a pamphlet that explains “How to Prevent Injuries in Brass Musicians” in each instrument case at the point of sale which gives a list of tips that helps to prevent injury like the ones discussed in this paper. These simple and easy steps could be taken to improve the overall health and health awareness of musicians.
Chapter V
Conclusions

The combination of interest in music and dentistry is the motive for this project. The goal of this project was to look at the different disorders that are caused by brass musical instruments as well treatments and preventions for such disorders. The connection with healthcare professionals was also expanded in hopes of bringing attention to the need for clear communication between musicians and physicians as well as the possible need for education on both sides regarding the issue of music-related disorders and injuries.

Though not the most prevalent issue, embouchure dystonia seems to have the most mystery to it and will require the most research in the future, especially with the new developments found by Skogseid. About 25% of the 70 survey participants stated they had dealt with a music-related injury in the past and 16 participants stated they had been diagnosed with orofacial disorders from playing brass instruments. These statistics are actually less than the prevalence found in other studies; however, this was probably because of the small sample size. Based on the survey, the mindset of injured musicians has changed since 100% of the participants who experienced problems openly stated that they received medical help for playing-related problems, which was different than past studies.

Different preventions and treatments for the playing-related issues were suggested by participants as well as found in the literature. Though these preventions such as stretching, taking breaks while playing, and limiting the amount of playing time are all valid for a musician, the implementation of a warning label/informative packet in and on each musical instrument product would be helpful and hopefully would help decrease injury
prevalence and increase knowledge and awareness of potential injuries in musicians. Studies like these should and will continue to be done in the future to increase knowledge and awareness of playing-related injuries among brass instrumentalists and musicians in general, and simple steps like warning labels could help create a new mindset in musicians about playing-related disorders and could start a real revolution in music as a hobby and career.
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Appendix

Sample of the Brass Instrumentalist/Musician Survey

1. What is your age?
   • 18 to 24
   • 25 to 34
   • 35 to 44
   • 45 to 54
   • 55 to 64
   • 65 to 74
   • 75 or older

2. What is your gender?
   • Female
   • Male

3. In what country do you currently reside?

4. If applicable, in what state or U.S. territory do you live?

5. What is your current profession/occupation?

6. Please choose the primary brass instrument that you play.
   • Trumpet
   • Trombone
   • Horn
   • Tuba/Euphonium
   • Other, please specify

7. How long have you played your brass instrument that you chose above?
   • 0-5 years
   • 5-10 years
   • 10-20 years
   • 20-30 years
   • More than 30 years

8. On average, about how many hours per week do you play/practice your primary brass instrument?
   • 0-10 hours per week
   • 10-20 hours per week
   • 20-30 hours per week
   • 30-40 hours per week
• More than 40 hours per week
• I don’t play anymore, but I used to
• None of the above

9. Have you ever experienced any problems/injuries that arose from playing of your primary brass instrument that resulted in needing to seek medical help?
   • Yes
   • No

10. If you answered YES to the above question, in the space below please briefly describe what the problem(s)/symptom(s) were.

11. What type of healthcare professional did you go to when seeking help? Check all that apply.
   • Primary Care/Family Practice Doctor
   • General Dentist
   • Orthodontist
   • Physical/Occupational Therapist
   • Specialist
   • Other, please specify
   • N/A

12. Have you ever HEARD OF the following disorders that are considered playing-related problems? Please check all that apply.
   • Focal/Embouchure Dystonia—embouchure/muscle cramps or involuntary muscle contractions
   • Brass Poisoning—from your mouthpiece losing its plating
   • Temporomandibular joint disorders (TMJ disorders)
   • Nerve impingements—compression of nerves which causes pain
   • Overuse related problems
   • Damage to the orbicularis oris (lip muscle)
   • Velopharyngeal insufficiency—when you play, some involuntary air goes through your nasal passage instead of all through the instrument
   • Viral Parotitis—swelling of the parotid glands
   • Contact Dermatitis—skin inflammation caused by an allergen or irritation
   • Other, please specify
   • None of the above

13. Have you ever BEEN DIAGNOSED with any the following disorders that are considered playing-related problems? Please check all that apply.
   • Focal/Embouchure Dystonia
   • Brass Poisoning
   • Temporomandibular joint disorders (TMJ disorders)
   • Nerve impingements
• Overuse related problems
• Damage to the orbicularis oris (lip muscle)
• Velopharyngeal insufficiency
• Viral Parotitis
• Contact Dermatitis
• Other, please specify
• None of the above

14. What TREATMENTS did the healthcare professionals prescribe for your specific problem? Problem explain. N/A if not applicable.

15. What PREVENTIONS did the healthcare professional prescribe for your specific problem? Please explain. N/A if not applicable.

16. If you have never been affected by any playing-related disorders, what have you done (of anything) to prevent problems from arising? (e.g. warm up properly, limit the amount of playtime, etc.)

17. How helpful was your provider at explaining your medical condition(s)?
   • N/A
   • Extremely helpful
   • Very helpful
   • Moderately helpful
   • Slightly helpful
   • Not at all helpful

18. Your healthcare provider was aware/knowledgeable of instrument playing-related disorders in general.
   • Strongly Agree
   • Somewhat Agree
   • Neutral
   • Somewhat Disagree
   • Strongly Disagree
   • N/A

19. Do you have any other comments, questions, or concerns?