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The Gold Metalist: An Examination of French Horn Mouthpieces Used by College Horn Players

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The University of Southern Mississippi


The Gold **Metalist**: An examination of French horn Mouthpieces used by college
horn players

by
Brittany White

A Thesis
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The University of Southern Mississippi
In Partial Fulfillment
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Abstract

College horn players struggle to find the “perfect” mouthpiece. Students spend time and money in their pursuit of mouthpiece perfection. Unfortunately, the perfect mouthpiece does not exist, but this study is designed to find ideal mouthpiece characteristics. It is the goal of this experiment to give college horn players a better understanding of mouthpieces. Participants were asked to try and score eight experimental mouthpieces in addition to their primary mouthpiece. It was determined that comfort was one of the most important aspects of a mouthpiece. If participants found the mouthpiece uncomfortable, all scores for that mouthpiece would suffer. While the study was not able to identify the “perfect” mouthpiece, this research study was able to identify ideal mouthpiece characteristics based on individual preference of the subject.

Key Words: French horn, Mouthpiece, Music major

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Chapter I

Introduction

For developing French horn players, finding the optimal mouthpiece can be a daunting endeavor. Time, frustration, and money are exhausted in an effort to find the perfect mouthpiece, but does the perfect mouthpiece actually exist?

The mouthpiece is the element of the horn where the initial physical and acoustic reactions occur. More specifically, the mouthpiece is the connection between buzzing lips, blowing air, and producing a tone on the instrument. In Plitnik and Lawson's article, "An investigation of correlations between geometry, acoustic variables, and psychoacoustic parameters for French horn mouthpieces," it is stated that the mouthpiece is the, "single most important component of the instrument" (Plitnik, Lawson, p. 1111).

Since the mouthpiece is the most important part of the instrument, it is imperative to select the right one, but how does a horn player select the correct mouthpiece? Should the player prioritize the rim, cup, or bore when selecting a mouthpiece? How does a particular horn player's ideal sound influence mouthpiece choice? How does the material used to make the mouthpiece affect the sound? Numerous theories have been presented by both professional horn players and teachers, but there is still no clear answer.

French horn mouthpieces are vastly different today than they have been in the past. According to Howe (1966) in his dissertation, "A Critical Survey of Literature, Materials, Opinions, and Practices Related to Teaching the French Horn," French horn mouthpieces were originally made of sheet metal, but today, mouthpieces are made of bronze and other metals. Mouthpieces today are often plated with a metal other than the base material, and different metals can provide a different feel for the player.

Howe (1966) reveals that early orchestral horn players believed that the 2nd horn player should have a larger mouthpiece than the principal player. This concept is still often followed today. Wide rims are thought to be beneficial to the low range, and shallow cups are thought to aid horn players in

the high range. The difference between the principal horn and the 2nd horn is primarily range, but how does the capability of the player affect mouthpiece choice?

Abulnaga (2007) suggests in his dissertation, “Appropriate choices of horn mouthpieces for players of varying levels based on the technical specifications and design of the three principal components: Rim, bore, and cup,” that different playing abilities require different types of mouthpieces. Specialized mouthpieces such as Paxman and Moosewood are better suited for more advanced players, but they are not recommended for the novice horn player. Certain mouthpiece manufactures, such as Schilke and Stork, are practical choices for players of both abilities.

Research suggests that beginning horn players should only use standard mouthpieces. The dimensions of these mouthpieces are fairly similar and do not deviate. Professionals have the ability to use mouthpieces that have vastly different dimensions than those used in the standard mouthpieces. Different mouthpieces are recommended for beginners and professionals, but what do these recommendations insinuate for the average college student? The college horn player is not a beginner and consequently, should not use a beginner’s mouthpiece. The majority of college players, however, do not possess the ability of a true professional. How does a college student make the appropriate mouthpiece selection? Should a college horn player use a customized mouthpiece as professionals do? If not, does the college level of playing warrant a different “standard” mouthpiece than beginning horn players? The purpose of this study is to investigate the advantages and disadvantages of mouthpiece shape, size, and material for the college French horn player. Various sizes and shapes of rim, cup, and bore will be tested by a selection of current college horn players. In addition to dimensions, various metals will be used in the experiment to determine material’s effect on sound. Using a Likert scale, the study will collect and analyze data on each mouthpiece’s performance regarding tone, articulation, intonation, flexibility, range, and comfort for each student.

There are several research questions in this experiment:

- What dimensions of a mouthpiece are the most effective for college horn players?
- Which component of the mouthpiece will have the most impact on how high a mouthpiece is rated?
- How influential is the material used to make the mouthpiece?
- Is there a “standard” mouthpiece for college horn players, or should they use their own customization of the mouthpiece?

The hypotheses for these questions:

- Different players will have different preferences, so a “standard” set of dimensions will not appear.
- The size and shape of the cup will be the most influential aspect of the mouthpiece.
- The metal used to make the rim will have an impact on desirability of a mouthpiece. Since the rim is the component of the mouthpiece that touches the face, it will affect comfort.
- While certain mouthpieces may be more widely appreciated, ultimately, there will be no “perfect” mouthpiece for the college horn player.

The results of this study will hopefully give college level horn players a better understanding of what mouthpiece might be best suited for them. By finding the ideal mouthpiece sooner, the student will be able to progress faster and save money by buying fewer mouthpieces.

Chapter II

Review of Literature

To establish a better foundation for this project, the following topics will be evaluated in the literature review. First, the history of mouthpieces will be examined in order to understand how the mouthpiece has evolved and why the French horn mouthpiece is what it is today. Next, the construction of mouthpieces will be examined to gain a better understanding of how different mouthpiece designs and dimensions have an effect on the quality of a mouthpiece. Finally, different playing capabilities will be considered in order to establish the need for different mouthpieces at different ages.

Origins of the French horn

In order to understand the modern French horn mouthpiece, it is important to investigate the origins of the French horn. According to Martin (1942), the origins of the French horn can be traced back to the use of animal horns as instruments, especially the shophar. The mouthpiece on this primitive instrument was formed when the point of the horn was removed. At the time, the instrument could only play two pitches a fifth apart. The alphorn is a later ancestor of the French horn. Martin described the mouthpiece used on this instrument as a “wooden cupped mouthpiece.” (Martin pg. 5) This new development in the horn greatly increased the range of the instrument.

The horn did not become an orchestral instrument until the 17th century, after it evolved from these two earlier instruments. When the horn arrived in the orchestral setting, the French horn and the trumpet sounded extremely similar. In fact, both the French horn and the trumpet used the clarin mouthpiece. The clarin mouthpiece had a bowl shape and was shallower than modern mouthpieces for both French horn and trumpet. In addition to the mouthpiece difference, the baroque horn did not have valves as the modern instrument does.

The instrument was now able to play higher notes in the harmonic series, and consequently, baroque composers often wrote musical passages in the high register of the horn.

The modern horn is quite different from the horn that first entered the orchestra during the baroque period, and it has different capabilities. Modern horn players no longer use the shallow clarin mouthpiece, so how does a modern musician accommodate the changes in the equipment when performing baroque era music? Falvey (2011), suggests that when playing baroque music, horn players should use a mouthpiece with a shallow cup, which is reminiscent of the clarin mouthpiece. Smaller bores are also considered to be ideal for reaching the notes in the high register, so it is suggested that a horn player should choose a mouthpiece with a small bore. Wider rims are thought to increase endurance, which would be helpful in playing baroque music, as extended time playing high range is extremely tiring for many players. These specifications will create a mouthpiece that, while still different, is reminiscent of the earliest years of the French horn.

Materials

According to Howe (1966), the materials and process involved in the manufacture of French horn mouthpieces in the eighteenth century was quite different than the process used today. Previously, mouthpieces were predominantly made out of sheet metal, but modern mouthpieces are often made with bronze. This is not to say, however, that other materials are not currently being used to make mouthpieces. In addition to the base material, many mouthpieces are coated in a different metal, particularly gold and/or silver. When mouthpieces were being formed from sheet metal, the mouthpieces were the same shape on the inside of the mouthpiece as they were on the outside of the mouthpiece. Today, due to the different manufacturing process, the inside and outside of mouthpieces can have varying shapes and sizes.

According to White (1980), Otto Schilke experimented with different metals in the manufacturing of brass mouthpieces. He believed that difference in materials could influence tone.

It was his theory that silver mouthpieces produced the best sound on the instrument. Wilcox (1957) performed a study on the effect the materials used to produce a mouthpiece had on the sound production. This study actually focused on trumpet, but due to the similar nature of the mouthpieces, the information is still applicable. It was found that plastic mouthpieces produced a very different sound than brass mouthpieces, and the sound of the brass mouthpiece was preferred among the musicians evaluated. It was determined that many of those questioned did not approve of the feeling of the plastic mouthpiece. This study contained professionals, college students and beginners. The professionals and college students, who have been playing the instrument the longest, did not approve of the plastic mouthpiece. All but one of the positive responses to plastic came from beginners. This indicates that brass players become accustomed to the feeling of a metal mouthpiece, but they may not have disliked the plastic mouthpiece when they first began playing the instrument. The researcher did not find a major difference in the tone produced by different types of metal. Some of the metals such as Dirilyte may be considered preferable to other metals because it does not corrode as much as some of the other metals. Aluminum was also distinguished from other materials because it is cost-effective.

Mouthpiece Manufacturing Process

As mentioned before, the process for manufacturing brass mouthpieces has changed drastically since the French horn entered the orchestral world in the seventeenth century. According to White (1980), Otto Schilke, a well-known trumpeter and mouthpiece manufacturer, helped create the process that modern mouthpiece companies use today. The mouthpiece begins as a tube, which is manipulated until the metal is thin enough. Schilke was one of the first manufacturers to create a layer of metal in addition to the tube. The original purpose of this extra layer was to protect the mouthpiece. His base mouthpiece was made of silver, and he would often coat the mouthpiece in sterling silver, which is more durable than pure silver. In later years, he began coating the base mouthpiece in bronze, which would create a better sound when played.

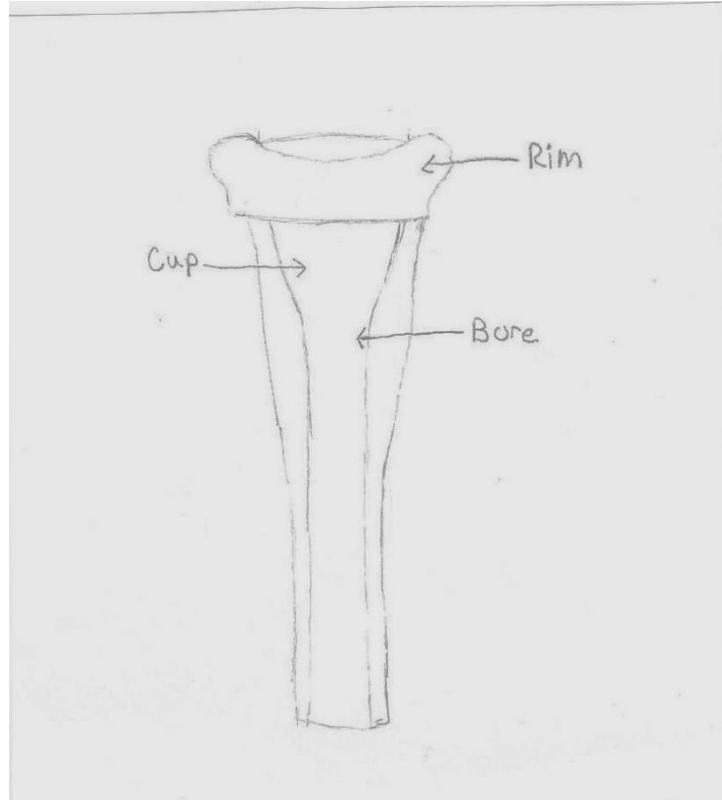


Figure 1

Components of a Mouthpiece

The three components of French horn mouthpieces that will be evaluated in this study are the rim, cup, and bore. In his book, Phillip Farkas (1956) addresses the various components of mouthpieces and the effects on playing. According to Farkas, the width of a rim can affect one's range, endurance, and accuracy, and the shape of a rim is likely to affect the articulation. This belief was also held by Fournier (1970). Farkas also believes that size and shape of the cup influences the quality of the tone produced. White (1980) believes that the cup of the mouthpiece can influence range in addition to tone. A deep cup will have a negative influence on the high range, while a shallow cup will aid the high range. While there are drawbacks to each cup, White suggests that a player use a larger

cup in order to produce the bigger tone. Farkas (1956) believes that the size of the bore influences the volume, tone, and range. How does one decide which aspect of the mouthpiece they should consider as their first priority?

In Lawson and Plitnik's study (1999), while not closely considering the rim, it was decided that the shape of the mouthpiece provided the greatest variance in a mouthpiece. They believed that the bore and depth of the cup were important, but ultimately the bore and depth had less impact on the overall acceptance of a mouthpiece. Fournier (1970) held similar beliefs to Plitnik and Lawson. He believed that while other components of the mouthpiece held an impact on the sound that the mouthpiece produced, the shape of the mouthpiece holds the most importance.

Even with hundreds of mouthpieces combinations available, Farkas and Fournier agree that there is not a perfect mouthpiece. While a mouthpiece might have excellent articulation due to the rim, the endurance of the mouthpiece might not be as strong because of the rim. Farkas believes the horn player should find a "compromise mouthpiece" (Farkas, pg.4).

Effect of Range on the Mouthpiece

As shown by the baroque era mouthpiece and the discussion on the effects of different mouthpiece components, some mouthpieces are generally better for a particular range. In the professional world, orchestral horn players often specialize as either a high horn player or a low horn player. At this point, many players will choose equipment more suited to their specialized range. In college, however, students are not yet choosing a range. They must have a primary mouthpiece that is well suited for all ranges.

The baroque mouthpiece was shallow in comparison to many of the horn mouthpieces available today, and it was well suited for high range playing. As previously discussed, both the rim and bore are thought to have an impact on range. Farkas (1956) believed that a wide rim and a large bore were both ideal for low range. He also believed that a narrow rim and a small bore were suitable

for the high range of the horn. Each scenario has drawbacks. For example, a mouthpiece might produce a better high range, but the tone may suffer as a result.

Effect of Ability on Mouthpiece Selection

The final topic that will be examined in the literature review is ability. The mouthpiece that a professional horn player needs is not the same mouthpiece that a beginning horn player needs. According to Howe (1966), a beginner should use one of the standard mouthpieces. While using the standard mouthpiece, they can develop good embouchure, which will allow them to better assess mouthpieces in the future. A professional, on the other hand, will not be pleased with the standard mouthpiece and will likely want something different. Abulnaga (2007), conducted a study examining mouthpiece selection for beginners and professionals. Mouthpieces manufactured by companies such as Moosewood and Paxman, were determined to be better for professional horn players. It was not recommended for beginners to use these mouthpieces. Certain aspects of the mouthpieces production will only be experienced by the experienced musician. While a professional may use a deep or shallow cup depending on their specialized range, Abulnaga believes a student should start on a medium cup mouthpiece. A beginner should not begin to experiment with larger mouthpieces until their embouchure has begun to develop.

Chapter III Methodology

Participants:

The participants in this study will be college-aged French horn players at the University of Southern Mississippi. Since participants will be found through the School of Music, all of the participants will be music majors pursuing either a music education or French horn performance degree. Varying levels of instrumental study will be tested as the study will examine players from freshman year through graduate level. Data on age and classification will be collected at the time of the experiment and will be a factor in the results.

Materials:

Table 1: Test Mouthpieces

Mouthpiece	Rim Size	Cup	Bore	Material
SF 14-0-2 Cup w/ E 17.5 Rim	17.5	Bowl	4.6mm	Stainless Steel Cup + Rim
SF 14-0-2 Cup w/ E 17.5 Gold Kote Rim	17.5	Bowl	4.6mm	Stainless Steel Cup+ Gold Coated Rim
SF 14-0-2 Cup w/ E 17.5 Black Kote Rim	17.5	Bowl	4.6mm	Stainless Steel Cup + Titanium Coated Rim

SF 14-0-2 Cup w/ 18.0 E Rim	18.0	Bowl	4.6mm	Stainless Steel Cup + Rim
SF 16-0-2 Cup w/ 17.5 E Rim	17.5	Bowl	4.4mm	Stainless Steel Cup + Rim
SF 16-0-2 Cup w/ 18.0 E Rim	18.0	Bowl	4.4mm	Stainless Steel Cup + Rim
Drehman 18-E-2 Cup w/ E 17.5 Rim	17.5	V-Cup	4.3mm	Stainless Steel Cup+ Rim
Drehman 18-E-2 Cup w/E 18.0 Rim	18	V-Cup	4.3mm	Stainless Steel Cup+Rim
Holton Farkas MDC	16.21	Cup	4.62mm	Silver Plate
Holton Farkas DC	17.07	Cup	4.83mm	Silver Plate

Procedure:

In this experiment, participants will be asked to try a variety of French horn mouthpieces. The researcher will meet with each participant separately. Between participants, each mouthpiece will be cleaned thoroughly.

Tone, articulation, intonation, flexibility, range, and comfort will be tested in this experiment. Participants will be given a specific exercise for tone, intonation, articulation, and flexibility. An

exercise written by the researcher, containing various articulations, will be used to determine how well the mouthpiece can play different lengths of notes. To test flexibility, participants will play the first three lines of Kopprasch etude number forty-seven. Two exercises will be given to test range. To test consistency in the high range, Wagner's Short Call, a common horn excerpt, will be used. To test low range consistency, an excerpt from Mahler's 1st Symphony will be used. A tuner will be used to measure intonation of each mouthpiece. The participant will play a series of notes while watching the tuner. The participant will record how sharp or flat notes are on different mouthpieces. An app, Tonal Energy, will be used to measure steadiness of tone. Participants will be asked to describe the tone produced by that mouthpiece. Is the tone bright or dark? Comfort will be rated by the participant after all other exercises are complete.

Before testing any of the experimental mouthpieces, each participant will play their own mouthpieces on the same exercises used for the experimental mouthpieces. This will act as a type of control, and it could ultimately show if there is a better mouthpiece option for that participant. After completion, the participant will try each of the experimental mouthpieces. During the experiment, the mouthpieces will be referred to as a number instead of the actual name of the mouthpiece. This will prevent bias about a mouthpiece brand or model that the participant may have prior to the experiment. The participant will play the same exercises for every mouthpiece, and will rate them using a Likert scale.

The researcher will be observing the participants as they test each mouthpiece. The researcher will rate each participant's mouthpiece experiment using the same Likert scale. The difference between the participant and researcher scales will be comfort, since the researcher will be unable to identify the physical comfort of each mouthpiece. The researcher's participation in this study will show if the player's perception of the mouthpiece is the same as a listener.

Data Analysis:

Data given by each participant will be compared, and many factors will be examined. Tone, articulation, intonation, flexibility, range, and comfort of each mouthpiece will be first examined individually. It will be determined if a trend appears within each category that will show which mouthpiece is superior in that particular aspect of playing. The data given by the participants will be then compared to the researcher's ratings of each experiment.

Level of comfort will be compared against the other aspects of the mouthpiece. If a mouthpiece is more comfortable, are the other qualities of the mouthpiece also rated well? If participants find one of the mouthpieces to be extremely uncomfortable, will all other qualities of the mouthpiece be less preferable?

At the end of the survey, participants will be asked to rank the test mouthpieces from favorite to least favorite. This data will be compared between participants. This will show if a particular mouthpiece is most preferred among the participants. In addition, if a mouthpiece is consistently rated low overall, it might show that a certain mouthpiece is not suitable for college level horn players. Participants will also be asked if they prefer their own mouthpiece or the test mouthpiece that they ranked the highest. This may provide data on if college students are using mouthpieces that are well suited to them. At this point in analysis, preference of mouthpiece and age will be compared to evaluate if there is a correlation. For example, do freshmen and graduate students prefer the same mouthpiece, or does experience make a difference? The differences between ensembles will also be examined. This may show how ability affects mouthpiece selection. While this will most likely produce a similar trend as the effect of age, there are exceptions. Younger students may be in a higher ensemble level than someone who is older.

Chapter IV

Data Analysis

The study was presented to the horn studio at the University of Southern Mississippi. Ten students responded and volunteered to participate. The participants presented a wide range of ages, experience, and mouthpiece preferences, but despite differences, trends began to surface. The only questions on the survey that produced unanimous results referred to current mouthpiece satisfaction and usage. None of the participants in the study regularly use more than one mouthpiece, and all participants reported satisfaction with their current mouthpiece. By the end of the study, after trying eight test mouthpieces, some participants reconsidered their satisfaction with their current mouthpiece. Table 2, shown below, provides the demographic information of each participant for later reference.

Table 2: Participant Demographics

Participant	Age	Gender	Class	Major	Years Exp.	Ensembles	# of Past Mpcs.	Years on 1 St Mpc.
1	19	F	Sophomore	B.M.E	6	Symph.	2	5
2	30	M	Senior	B.M.	17	W.E./Orch.	1	5
3	24	M	Graduate	M.M	14	W.E./Orch.	4	4
4	20	M	Sophomore	B.M.E	8	W.E./Orch.	3	2.5
5	21	F	Junior	B.M.E.	3	Concert	2	1
6	20	M	Junior	B.M.E./ B.M.	3	Symph./ Orch.	2	4 months
7	18	F	Freshman	B.M.E.	7	Symph.	2	2
8	31	F	Graduate	D.M.A	21	None	3	17
9	22	F	Senior	B.M.	11	W.E./Orch.	3	6
10	24	M	Senior	B.M.E.	12	None	3	5

Table 3 below shows the overall average score of each mouthpiece. Scores were given on a scale of 1 to 5. A score of 1 is poor, and a score of 5 is excellent. To produce the overall average, the

average was first taken from each category. Those averages will be presented later in the analysis. The researcher then took the average score of the categories to produce these averages.

Table 3: Overall Average Score

Mouthpiece	Primary	#1	#2	#3	#4	#5	#6	#7	#8
Average Score	3.87	3.85	3.4	3.44	3.6	3.48	3.64	3.51	3.64

Overall, participants favored their primary mouthpiece, but experimental mouthpiece 1 received a similar score. Mouthpieces 2 and 3 were the most disfavored in the study. These were the only mouthpieces using rims coated in a material other than silver. Since the material of the rims were the only differences between mouthpieces 1, 2, and 3, it may be concluded that participants prefer stainless steel over gold and titanium.

Each mouthpiece was tested in seven categories. The first category that participants were asked to complete on each mouthpiece was high range. The highest participant ranked mouthpiece for high range was test Mouthpiece 1, which received an average score of 3.7. The average score given by participants to their primary mouthpiece was also a 3.7. Mouthpieces 3 and 4 had the lowest scores for high range, with an average of 3.1. When separating data by ensemble, the Wind ensemble players highly favored Mouthpiece #1. All Wind ensemble players ranked the mouthpiece at 4 or 5. Symphonic horns were lower and more varied, as the scores ranged from 2 - 4. Participant 6 was the only member of the study to rank this mouthpieces lower than 3. Participant 6 has only been playing horn for 3 years, which is the least amount of time spent playing horn. Participant 6 is the only person that is a double major and the only participant to be in both Symphonic band and Orchestra. This

participant also spent the least amount of time on his beginner mouthpiece. It is difficult to determine the cause of the lower score, as this participant is an outlier in many ways. Table 4 shows the results discussed above.

Table 4: High Range

Mouthpiece	Primary	#1	#2	#3	#4	#5	#6	#7	#8
Average									
Score	3.7	3.7	3.6	3.1	3.1	3.2	3.4	3.5	3.3

Using the results from Table 4, we can gain insight on the mouthpiece characteristics that make mouthpieces suitable for the high range. Mouthpieces 1 and 2 received the highest scores, and Mouthpieces 3 and 4 received the lowest scores. All four of these mouthpieces used the same cup, the San Francisco 14-0-2. Mouthpieces 1, 2, and 3 used the same model and size of rim, but each rim was coated in a different material. The rim of Mouthpiece 2 is gold, which suggests that gold may be a suitable material for high range. The rim of Mouthpiece 3 is titanium, which was highly disfavored, suggesting that titanium is not ideal for high range. The sole difference between Mouthpieces 1 and 4 is the size of the rim. Both rims are Houser's E model, but Mouthpiece 1 is a 17.5 mm and Mouthpiece 4 is an 18.0 mm. This suggests that a smaller rim is well-suited for high range, but Mouthpieces 5 and 6 contradict this assessment. Mouthpiece 5 has the same rim as 1, and Mouthpiece 6 has the same rim as 4. Mouthpiece 6 was found to be more favorable in the high range than 5. This suggests that the true difference lies in the combination of rim size and bore size.

A small rim with a large bore and a large rim with a small bore are favorable. A large rim with a large bore and a small rim with a small bore are less favorable.

After assessing the high range, participants were asked to score each mouthpiece on low range. Mouthpiece 4 was ranked the highest, with an average score of 4.1. This mouthpiece scored higher than the participants' primary mouthpieces, which received an average score of 4. The scores on Mouthpiece 4 range from 2 - 5. Again, only one participant gave the mouthpiece a score of 2, which was participant 8. This participant does not have anything that separates them in their demographics, so the researcher is led to assume that another cause, such as facial structure, is the reason for the lower score. The scores for Mouthpiece 7 were unusual. Nine of the ten participants gave this mouthpiece a score of 3. Participant 1 is the only person to rank the mouthpiece differently, and she ranked the mouthpiece as a 5, which is a fairly large difference. As before, no demographic information stands out, so the researcher is led to believe that another factors caused this difference. Mouthpiece 1 should also be acknowledged in the low range category, as the score closely followed mouthpiece 4, with a score of 4.0. Mouthpiece 4 was given a score of 5 by only three participants, but five participants gave Mouthpiece 1 a score of 5. Each mouthpiece was given one score of 2. Since Mouthpiece 1 received more scores of 3, Mouthpiece 4 had a higher average. The comparison of Mouthpiece 1 and 7's dimensions should be noted. The same rim was used for each combination. The difference must be attributed to the cup. It can be inferred that the cup used in 1 is more preferable for low range than the cup used by Mouthpiece 7. The data discussed above is shown below in Table 5.

Table 5: Low Range

Mouthpiece	Primary	#1	#2	#3	#4	#5	#6	#7	#8
Average									
Score	4.0	4.0	3.8	3.4	4.1	3.7	3.6	3.2	3.2

As with high range, the data shows some ideal dimensions for playing in the low register of the horn. It has been accepted by horn players that a larger rim will aid in the low range. By viewing the scores given in this study, there is only a slight difference in the scores between Mouthpiece 4, with the large rim, and Mouthpiece 1, with the small rim. In fact, one participant gave 1 a score of 5, which was a score not given to 4. For some, the smaller rim was more favorable for low range. It should also be noted that 7 and 8 were the lowest scores, and both mouthpieces used the same cup. Mouthpiece 7 used the 17.5 mm and 8 used the 18.0 mm. The cup must be unfavorable for low range, since size of the rim held no significance. This proves that when looking for a low horn mouthpiece, one must consider more than the rim size.

Before moving on, it is worthwhile to examine the combination of high and low range. Since college students have not yet “specialized” in a range, they need a mouthpiece that is capable in all ranges. The average of the high and low range were combined to create the average score in range. The highest overall score was given to mouthpiece 1, with an overall average of 3.85. The lowest overall average for range was given to Mouthpiece 3. Both mouthpieces used the same cup, and the rims were the same model. The only difference is the material of the rim, as Mouthpiece 3 is titanium. The researcher determined that the comfort of the mouthpiece could be the cause of this drastic difference in preference. While this will be discussed more thoroughly later in the analysis, Mouthpiece 1 was given the highest comfort rating, while Mouthpiece 3 received the lowest comfort rating.

The next category to be examined is articulation. The highest score was given to Mouthpiece 1, which had an average score of 4.3. The lowest score was a three-way tie between Mouthpieces 2, 4, and 5, with a score of 3.5. Mouthpiece 1 was given a score of 5 by five of the participants, and only two participants gave this mouthpiece a score of 3, which was the lowest score given. Eighty percent of the participants believed this mouthpiece to have clear or very clear articulations.

Mouthpiece 2 was given only one score of 5, by participant 3 and it was given one score of 2, by participant 8. These participants were the only two graduate students in the study. Since the scores vary so greatly between the graduate students, level of schooling had no effect on this category.

Mouthpiece 4 was not given any scores of 5. Participant 6 gave this mouthpiece a score of 2. This is not the first time that participant 6 has been an outlier with scores, but the demographic information on this participant is different from any of the other participants. Mouthpiece 5 was given two scores of 5. As with Mouthpiece 2, participant 3 gave Mouthpiece 5 a ranking of 5 and, participant 8 gave the mouthpiece a ranking of 2. The results discussed above are shown in Table 6.

Table 6: Articulation

Mouthpiece	Primary	#1	#2	#3	#4	#5	#6	#7	#8
Average Score	3.7	4.3	3.5	3.7	3.5	3.5	3.8	3.8	3.7

Intonation was the next category studied in the experiment. Mouthpiece 8 received the highest average, with a score of 3.8. The lowest score, 3.4, was given to Mouthpieces 2 and 4. Intonation received one of the smallest spreads between the highest and lowest average scores. Participants did not hear as much difference in this category as they did in others, such as range. Mouthpiece 8 was given a score of 5 by only three participants, and two participants gave the Mouthpiece a score of 2. The scores of 2 were given by participants with a demographic area that set them apart. Participant 5 is the only member of the study that is in concert band. Participant 7 is the only freshman in the study. Since the separating categories are different, it is difficult to draw conclusions from this data. Participant 5 also gave Mouthpiece 2 a score of 2. The other score of 2 was given by participant 9,

who is a member of the Wind Ensemble. Participants 7 and 8 gave Mouthpiece 4 a score of 2. The results are shown below in Table 7.

Table 7: Intonation

Mouthpiece	Primary	#1	#2	#3	#4	#5	#6	#7	#8
Average Score	3.8	3.6	3.4	3.5	3.4	3.5	3.6	3.7	3.8

Since the scores are so close, it is difficult to distinguish the dimensions that produce the best intonation. Mouthpieces 7 and 8 were the participants' top two choices. While the mouthpieces have different rims, they used the same cup. The cup has the smallest bore, but it also has a different shape than the previous two cups.

Tone was one of only two categories that the participants' primary mouthpieces scored higher, on average, than any of the test mouthpieces. Primary mouthpiece tone quality was given an average score of 4.1. The highest experimental mouthpiece average score was given to Mouthpiece 6, which received a score of 3.8. Surprisingly, only one participant scored the mouthpiece as a 5 in this category. As discussed above, participant 6 has several characteristics that sets him apart from the rest, and this is not the first time that this participant has provided contrasting results from the other participants. Seven of the ten participants gave this mouthpiece a score of 4. The only participants, besides participant 6, to give this mouthpiece a lower score were participants 2 and 8, which are the oldest members of the study. The mouthpiece with the lowest average score for tone was Mouthpiece 2. While the scores were overall lower than other mouthpieces, it should be noted that this mouthpiece received the full range of scores between 1 and 5. Participant 5 gave the mouthpiece an overall score of 5 on tone. In contrast, participant 9 gave the mouthpiece a score of 1 on tone. These participants

perform with the same ensembles, and only have two years difference in age. The results are shown below in Table 8.

Table 8: Tone

Mouthpiece	Primary	#1	#2	#3	#4	#5	#6	#7	#8
Average Score	4.1	3.7	3.2	3.4	3.6	3.5	3.8	3.6	3.5

Tone is a difficult category to test. While the tonal energy app was used in this experiment to aid participants in scoring tone, different performers have different perceptions of what constitutes a good tone. Some prefer a dark, rich sound, but others prefer a bright, edgy sound. Varying opinions could account for the wide range of scores given, especially for mouthpieces such as Mouthpiece 2. The scoring of the primary mouthpiece should also be considered. The primary mouthpiece category was given an average score of 4.1, which is a fairly high score in the entire study, not just this category. This could be the result of two occurrences. First, participants may already be playing on mouthpieces that provide them with an acceptable tone. The other possibility lies in the sound quality that they are accustomed to hearing. Whether consciously or unconsciously, the participants may have the perception that their tone is ideal. It would be interesting to consider how participants would rank the mouthpieces in this category if they were listening to recording of themselves, without knowing the mouthpiece selection being heard.

While some categories have had a wide range of scores, flexibility does not fall in this category. Excluding the primary mouthpiece category, all mouthpieces had an average score of 3.0 or 3.6.

Mouthpieces 1, 3, 4, 5, 6, and 8 were given a 3.6. Mouthpieces 2 and 7 were given the lower average score of 3.0. The outcome of this category raises some interesting questions. Most importantly to this study, one must ask if the mouthpiece truly has a significant influence on flexibility, or do flexibility scores depend on the individual student's abilities? On the surface, ability is a plausible explanation for the scores, and a further analysis of the data shows that this is most likely the case. Upon closer examination, the researcher found numerous trends throughout the data for flexibility. For example, participant 1 gave four of the eight mouthpieces a score of 3, and she gave three of the eight mouthpieces a score of 4. Participant 4 gave seven of the eight experimental mouthpieces a score of 4 in flexibility. Participant 3 gave six of the eight experimental mouthpieces a score of 5. Given the wide array of mouthpieces, one would expect more variety among the scores, especially if the mouthpiece had an effect on flexibility. The results are shown below in Table 9.

Table 9: Flexibility

Mouthpiece	Primary	#1	#2	#3	#4	#5	#6	#7	#8
Average Score	3.5	3.6	3.0	3.6	3.6	3.6	3.6	3.0	3.6

The final, and possibly most important, category evaluated in this study was comfort. As with tone, the highest average score was given to the primary mouthpiece category. No participant gave their primary mouthpiece a score lower than 3. The result is not unexpected, as participants are accustomed to the feeling of their primary mouthpiece. Therefore, it is logical that participants would find their own mouthpiece preferable. Mouthpiece 1, however, was given a score of 4.1, which was the highest score given to any of the experimental mouthpieces.

Almost all of the participants scored Mouthpiece 1 as a 4 or a 5. Only one member of the study, participant 7, gave this mouthpiece a score of 2. While it may be irrelevant, it should be noted that participant 7 is the youngest participant in the study and is the only member classified as a freshman. Mouthpieces 3 and 5 tied for the lowest average score, with a 3.4. Only one participant found Mouthpiece 3 deserving of a score of 5, and no participants ranked Mouthpiece 5 higher than 4. The results are shown below in Table 10.

Table 10: Comfort

Mouthpiece	Primary	#1	#2	#3	#4	#5	#6	#7	#8
Average Score	4.3	4.1	3.5	3.4	3.9	3.4	3.7	3.8	3.8

While the researcher believed that comfort would play an important role in the overall preference among the mouthpieces, it was anticipated that the rims would play a more substantial role in comfort. Mouthpieces 1, 5, and 7 all used the same rim, but the scores vary by 0.6. Mouthpieces 4, 6, and 8 all used the same rim, and the scores only vary by 0.2, which is closer to the expected outcome. It is also interesting to note that mouthpieces 7 and 8 received the same score in this category and have different size of rims. The next logical assumption would be that the cup was responsible for the variety of scores, but Mouthpieces 1, 2, 3, and 4 dismiss that theory. Ultimately, it must be the combination of the rim and cup that determines whether or not the mouthpiece is comfortable.

As noted above, comfort produced some of the most important results in the study. The researcher believes that comfort may have a vast influence on mouthpiece choice. Earlier data analysis alluded to comfort determining the overall preferability of mouthpieces.

The data collected in this study provides evidence to support this claim. At the end of the study, after scoring their own mouthpiece and the eight experimental mouthpieces, participants were asked to rank the mouthpieces from 1 - 9 based on their preferences. During the course of the experiment, the researcher observed all ten of the participants as they completed the final ranking of the mouthpieces. Only one member of the study, participant 10, ranked the mouthpieces by the overall numerical score. Generally, if a participant scored a certain mouthpiece low on comfort, the mouthpiece ranked low in the overall ranking of the mouthpiece order. Tables 11 and 12 below show the rankings that participants gave versus the rankings that should have been given numerically, if considering the mouthpiece in its entirety. Note: In the tables, P denotes the participant's primary mouthpiece, and T denotes a tie.

Table 11: Actual Participant Rankings

Participant	1	2	3	4	5	6	7	8	9
1	#8	P	#1	#7	#4	#3	#2	#6	#5
2	P	#4	#1	#6	#7	#2	#3	#5	#8
3	#1	P	#2	#3	#4	#5	#6	#8	#7
4	#8	P	#7	#6	#4	#5	#1	#3	#2
5	#4	P	#3	#1	#5	#8	#2	#6	#7
6	#5	P	#6	#7	#8	#2	#3	#4	#1
7	P	#5	#2	#6	#8	#7	#3	#1	#4
8	#1	P	#2	#7	#8	#3	#6	#4	#5
9	#8	P	#6	#4	#5	#7	#1	#2	#3
10	#6	#8	#1	#4	#7	P	#2	#3	#5

Table 12: Rankings based on numerical scores

Participant	1	2	3	4	5	6	7	8	9
1	#8	#7	#4	#3	TP	T#2	T#5	#1	#6
2	P	#1	#4	#6	#2	T#5	T#7	#8	#3
3	T#1	T#2	TP	T#3	#6	#4	T#5	T#8	#7
4	TP	T#2	T#6	T#7	T#1	T#3	T#4	T#8	#5
5	#1	T#3	T#4	#7	TP	T#5	#2	#8	#6
6	#6	#5	T#3	T#7	TP	T#1	T#2	#8	#4
7	#5	T#2	T#6	#8	TP	T#3	T#4	#7	#1
8	#1	TP	T#7	T#8	#3	#2	#4	#5	#6
9	T#6	T#8	P	T#1	T#4	#5	#7	#3	#2
10	#4	T#1	T#6	T#8	TP	T#2	T#3	T#7	#5

It is apparent from the tables above that participants were not ranking the mouthpieces by numerical rankings alone. While all of the mouthpieces do notice some shift in rankings, the mouthpiece that has the most noticeable change is the primary mouthpiece. Five of the participants should have ranked their mouthpiece no higher than 5th, however, all members of the study except participant 10 ranked their primary mouthpiece as the first or second choice. In three of the seven individual categories, experimental mouthpieces scored higher than primary mouthpieces. In two of the remaining categories, the primary mouthpiece scored equal to the top experimental mouthpiece. If comfort and tone are the only superior categories, why do participants favor them so highly?

One question asked before the study began referred to importance of different playing aspects of a mouthpiece. Participants were asked to rank tone, range, articulation, intonation, flexibility, and comfort in order from most to least important. A rating of 1 implies that the aspect is very important, and a score of 6 implies that the aspect is the least important to the participant. The rankings are shown in the chart below.

Table 13: Important Mouthpiece Qualities

Participant #	Tone	Range	Articulation	Intonation	Flexibility	Comfort
1	2	4	5	3	6	1
2	1	5	6	3	2	4
3	1	4	6	3	5	2
4	1	5	6	4	3	2
5	2	3	2	1	1	1
6	1	6	5	3	4	2
7	2	4	6	1	3	5
8	6	3	4	5	1	2
9	1	4	3	2	5	6
10	1	5	3	2	4	6
Average Score	1.8	4.3	4.6	2.7	3.4	3.1

Overall, tone was ranked as the most important aspect to consider when choosing a mouthpiece. Only one participant did not rank tone as the 1st or 2nd most important aspect. Range and articulation were ranked fairly low. Articulation was ranked as least important four out of ten times. This data shows that tone was important to this group of participants. This could be a possible explanation of why participants chose the rankings. A comparison of tone versus overall average is shown below.

Table 14: Tone vs. Overall Average

Mouthpiece	Primary	#1	#2	#3	#4	#5	#6	#7	#8
Overall Average	3.87	3.85	3.4	3.44	3.6	3.48	3.64	3.51	3.64
Tone Average	4.1	3.7	3.2	3.4	3.6	3.5	3.8	3.6	3.5

The table above shows a strong correlation between the rankings of mouthpieces overall and their rankings by tone. The primary mouthpieces were given the highest score in each of the categories. Mouthpieces 2 and 3 received the lowest scores in both categories. When the other rankings are taken in to account, it is shown that there is a strong relationship between the scores for tone and overall. The next question: Is comfort as important as tone?

Table 15: Comfort vs. Overall Average

Mouthpiece	Primary	#1	#2	#3	#4	#5	#6	#7	#8
Overall Average	3.87	3.85	3.4	3.44	3.6	3.48	3.64	3.51	3.64
Comfort Average	4.3	4.1	3.5	3.4	3.9	3.4	3.7	3.8	3.8

As with tone, comfort does show a correlation to the overall average score. Primary has the highest score in both categories. Mouthpiece 1 is the top experimental mouthpieces in each category, and again, Mouthpiece 3 is one of the lowest ranked mouthpieces in each category.

If participants are choosing mouthpieces on the basis of tone or comfort, are they allowing these categories to change their overall perception of the mouthpiece? To study this, the researcher also scored each participant on all of the mouthpieces. The overall average scores given by the participant vs given by the researcher can be seen below.

Table 16: Participant vs. Researcher Overall Average

Mouthpiece	Primary	#1	#2	#3	#4	#5	#6	#7	#8
Participant									
Average	3.87	3.85	3.4	3.44	3.6	3.48	3.64	3.51	3.64
Researcher									
Average	3.6	3.9	3.7	3.36	3.51	3.51	3.4	3.85	3.76

As shown above, the researcher had a different perception of the mouthpieces. The researcher ranked the primary mouthpieces significantly lower than participants. The only category the researcher could not score was comfort, which likely counted for some discrepancy. The averages for Mouthpiece 1 were very close, but others, such as Mouthpiece 2 had a noticeable difference. While some of the individual categories were close, others had differences of over one point. Participants gave mouthpiece a 3.2 on tone, but the researcher gave an average of 4.3. Mouthpiece 2 was given one of the lowest scores for comfort. Did comfort change the perception of the tone?

Chapter V

Conclusion

While trends did surface in the data, it is difficult to find firm conclusions to the original research questions with only ten participants, but useful data did surface. One question asked by the researcher at the beginning of the study was, what dimensions of mouthpieces are the most effective for college horn players? The hypothesis was that no “standard” set of dimensions would appear. The hypothesis was proven correct by the study. Mouthpiece 1 was the most preferred mouthpiece in the study, but several participants found the mouthpiece to be unsatisfactory. Since the mouthpiece was not suitable for everyone, it cannot be considered the “standard” dimensions for college horn players.

The second research question referred to the most important component of the mouthpiece. The researcher hypothesized that the cup would have the most considerable impact on the mouthpiece’s favorability. The hypothesis is partially true. For some participants, the cup played a large role in the favorability of the mouthpiece. Participant 8, for example, ranked Mouthpiece 1 as their favorite and Mouthpiece 5 as their least favorite mouthpiece. The sole difference lies in the cup of the mouthpieces. Mouthpiece 1 has a larger bore than mouthpiece 5.

The third research question regards the material used to make the mouthpiece. The researcher hypothesized that material would be influential on mouthpiece preference. More specifically, the researcher hypothesized that the material coating the rim would affect comfort, as the rim is the component of the mouthpiece directly touching the face. This hypothesis is valid. Mouthpieces 2 and 3, the only rims that were not stainless steel, were ranked low on comfort. The cause for this occurrence is uncertain. Why were gold and titanium rims unfavorable to the members of this study? Participant 3 is the only member of the study that regularly uses a mouthpiece with a rim material

other than stainless steel. Unfamiliarity could be the primary cause for undesirability of the gold and titanium coating, but more research is required to have a strong conclusion.

The final question asked if there was a “standard” mouthpiece for college horn players. The data implies that there is no “standard.” Some dimensions were preferable overall, but outliers existed in every case. There was no single mouthpiece that was favored by everyone. Five of the eight experimental mouthpieces were given the highest score by at least one participant.

The goal of this study was to find the mouthpiece characteristics of mouthpieces preferable to college horn players. While no longer a beginner, the college student is not as advanced as a professional horn player. The study shows that certain mouthpiece characteristics are favorable to college horn players. Further study is needed to fully identify each of these characteristics.

The study contains several weaknesses and areas for improvement. A larger participant group would be preferable and could allow for clearer outcomes. A larger variety of mouthpieces would have been preferable, as the study was fairly limited. Only four rims and three cups were used in this experiment. While varied, the selection was not an accurate representation of the choices available to college horn players. To improve the study, it would be useful to record participants playing on each mouthpiece. All categories, besides comfort, could be evaluated from a recording. Implementing this process would reduce participant bias stemming from the comfort of the mouthpiece. It would give participants an accurate representation of tone, and their scores could be given accordingly.

Articulation should have been split into different categories. The researcher found difficulty scoring this category because articulation across the ranges varied. Only having one category limited the data.

In the future, this study could be applied to other instruments and age groups. If the study was performed with a larger participant group, more comparisons might be made between ages and experiences. In this study, the demographic information was very different for each participant, making comparisons difficult. If this study was performed again, the researcher should include more mouthpieces to study a wider range of mouthpiece dimensions, shapes, and materials.

Appendix A: Survey

Circle: Male Female

Choose Classification: Freshman
Sophomore
Junior
Senior
Graduate

Age: _____

Years of experience playing horn: _____

Circle Major: Music Education Music Performance

Current Ensembles: _____

Model of horn: _____

Model of primary mouthpiece: _____

Do you use more than one mouthpiece regularly? Yes No

Are you satisfied with your current mouthpiece? Yes No

How many mouthpieces have you used for an extended period of time (3 months or more)? _____

Model of your beginner mouthpiece: _____

How long did you use your beginner mouthpiece? _____

Please rank in order the importance of the following qualities when choosing a mouthpiece. 1= most important. 6= least important:

_____ Tone

_____ Range

_____ Articulation

_____ Intonation

_____ Flexibility

_____ Comfort

As you play the exercises given, rate your primary mouthpiece in the following categories:

High Range

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Low Range

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Articulation

5	4	3	2	1
Very Clear	Clear	Somewhat Clear	Unclear	Very Unclear

Intonation

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Tone

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Flexibility

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Comfort

5	4	3	2
Very Comfortable	Comfortable	Somewhat Comfortable	Uncomfortable

1

Very Uncomfortable

Rate Test Mouthpiece # 1 in the following categories:

High Range

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Low Range

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Articulation

5	4	3	2	1
Very Clear	Clear	Somewhat Clear	Unclear	Very Unclear

Intonation

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Tone

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Flexibility

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Comfort

5	4	3	2
Very Comfortable	Comfortable	Somewhat Comfortable	Uncomfortable

1

Very Uncomfortable

Rate Mouthpiece # 2 in the following categories:

High Range

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Low Range

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Articulation

5	4	3	2	1
Very Clear	Clear	Somewhat Clear	Unclear	Very Unclear

Intonation

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Tone

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Flexibility

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Comfort

5	4	3	2
Very Comfortable	Comfortable	Somewhat Comfortable	Uncomfortable

1

Very Uncomfortable

Rate Mouthpiece #3 in the following categories:

High Range

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Low Range

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Articulation

5	4	3	2	1
Very Clear	Clear	Somewhat Clear	Unclear	Very Unclear

Intonation

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Tone

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Flexibility

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Comfort

5	4	3	2
Very Comfortable	Comfortable	Somewhat Comfortable	Uncomfortable

1

Very Uncomfortable

Rate Mouthpiece #4 in the following categories:

High Range

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Low Range

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Articulation

5	4	3	2	1
Very Clear	Clear	Somewhat Clear	Unclear	Very Unclear

Intonation

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Tone

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Flexibility

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Comfort

5	4	3	2
Very Comfortable	Comfortable	Somewhat Comfortable	Uncomfortable

1

Very Uncomfortable

Rate Mouthpiece #5 in the following categories:

High Range

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Low Range

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Articulation

5	4	3	2	1
Very Clear	Clear	Somewhat Clear	Unclear	Very Unclear

Intonation

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Tone

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Flexibility

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Comfort

5	4	3	2
Very Comfortable	Comfortable	Somewhat Comfortable	Uncomfortable

1

Very Uncomfortable

Rate Mouthpiece # 6 in the following categories:

High Range

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Low Range

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Articulation

5	4	3	2	1
Very Clear	Clear	Somewhat Clear	Unclear	Very Unclear

Intonation

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Tone

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Flexibility

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Comfort

5	4	3	2
Very Comfortable	Comfortable	Somewhat Comfortable	Uncomfortable

1

Very Uncomfortable

Rate Mouthpiece #7 in the following categories:

High Range

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Low Range

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Articulation

5	4	3	2	1
Very Clear	Clear	Somewhat Clear	Unclear	Very Unclear

Intonation

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Tone

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Flexibility

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Comfort

5	4	3	2
Very Comfortable	Comfortable	Somewhat Comfortable	Uncomfortable

1

Very Uncomfortable

Rate Mouthpiece #8 in the following categories:

High Range

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Low Range

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Articulation

5	4	3	2	1
Very Clear	Clear	Somewhat Clear	Unclear	Very Unclear

Intonation

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Tone

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Flexibility

5	4	3	2	1
Excellent	Good	Average	Below Average	Poor

Comfort

5	4	3	2
Very Comfortable	Comfortable	Somewhat Comfortable	Uncomfortable

1

Very Uncomfortable

After testing all mouthpieces, rank in order your favorite overall mouthpiece (1) to your least favorite overall mouthpiece (9)

_____ Your Mouthpiece

_____ Mouthpiece #1

_____ Mouthpiece #2

_____ Mouthpiece #3

_____ Mouthpiece #4

_____ Mouthpiece #5

_____ Mouthpiece #6

_____ Mouthpiece # 7

_____ Mouthpiece # 8

If your mouthpiece is not ranked # 1, would you now consider changing mouthpieces?

Yes No N/A

Did you notice a significant difference between the various mouthpieces? Yes No

Appendix B: Musical Examples

in F.
Vivace.

6 *f* (sulla scena) *lungo*

5 *f*

Allegro (♩ ♩)

f in F. 2 3 4 5

Detailed description: This musical score consists of three systems. The first system is a piano part with two staves, marked 'in F. Vivace.' and '6', with dynamics '*f* (sulla scena)' and '*lungo*'. The second system is a piano part with two staves, marked '5' and '*f*'. The third system is a piano part with two staves, marked 'Allegro (♩ ♩)', '*f* in F.', and measures 2, 3, 4, and 5.

*Wagner's Short Call was used to evaluate high range

13 Wieder etwas bewegter
(Celli u. Bässe pizz) deutlich

14 *sempre pp*

sempre pp

15 1

Detailed description: This musical score is for the cellos and basses, marked 'Wieder etwas bewegter (Celli u. Bässe pizz) deutlich'. It consists of three systems of bass clef staves. The first system starts at measure 13 and includes measure 14. The second system includes measure 14 and measure 15. The third system includes measure 15. Dynamics include '*sempre pp*' and a final measure marked '1'.

*This excerpt, from Mahler's Symphony No. 1 was used to evaluate low range

The image shows four staves of musical notation in 4/4 time. The first staff contains four measures of quarter notes: C4, D4, E4, F4, G4, A4, B4, C5. The first three measures have an accent (>) above the note. The second staff contains four measures of quarter notes: C4, D4, E4, F4, G4, A4, B4, C5. The first two measures have an accent (>) above the note. The third staff contains four measures of quarter notes: C4, D4, E4, F4, G4, A4, B4, C5. The first two measures have an accent (>) above the note. The fourth staff contains four measures of quarter notes: C4, D4, E4, F4, G4, A4, B4, C5. The first two measures have an accent (>) above the note.

*This exercise was used to evaluate articulation. The articulations marked in the first three measures remain throughout.

The image shows the first line of musical notation for Kopprasch Etude No. 47. It is in 2/4 time and features a complex rhythmic pattern with many triplets and slurs. The notation is written on a single staff with a treble clef. The piece starts with a forte (f) dynamic. The first line contains 16 measures. The first four measures are marked with triplets (3) and slurs. The fifth measure has a slur and a fermata. The sixth measure has a slur and a fermata. The seventh measure has a slur and a fermata. The eighth measure has a slur and a fermata. The ninth measure has a slur and a fermata. The tenth measure has a slur and a fermata. The eleventh measure has a slur and a fermata. The twelfth measure has a slur and a fermata. The thirteenth measure has a slur and a fermata. The fourteenth measure has a slur and a fermata. The fifteenth measure has a slur and a fermata. The sixteenth measure has a slur and a fermata. The piece ends with a mezzo-forte (mf) dynamic and a triplet.

*The first line of Kopprasch Etude No. 47 was used to evaluate flexibility

Appendix C: IRB Approval Letter

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but no later than 10 days following the event. This should be reported to the IRB office via the "Adverse Effect Report Form."
- If approved, the maximum period of approval is limited to twelve months.

Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 17092604

PROJECT TITLE: The Gold "Metalist": An Examination of French horn Mouthpieces used by College Horn Players

PROJECT TYPE: Honor's Thesis Project

RESEARCHER(S): Brittany White

COLLEGE/DIVISION: College of Arts and Letters

DEPARTMENT: Music

FUNDING AGENCY/SPONSOR: N/A

IRB COMMITTEE ACTION: Exempt Review Approval

PERIOD OF APPROVAL: 10/05/2017 to 10/04/201

Lawrence A. Hosman, Ph.D.
Institutional Review Board

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