A Review of Research on the Meaning of "Support" in Brass Pedagogy

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sounds annoying during his nap time, still attended every performance of mine in Taiwan. I would not have been able to complete my education without their support and love.

Abstract

"The good teacher discovers the natural gifts of his pupils and liberates them by the stimulating influence of the inspiration that he can impact. The true leader makes his followers twice the men they were before"

Stephen Neill, *A Genuinely Human Existence*

Teaching music is an art. Music provides the broadest creative landscape for the imagination because it is art at its freest and most abstract,[1] as Laura Ritchie and Aaron Williamon point out. They go on, "The arts have been shown to positively impact students' achievement and motivation."[2] Music teaches students the creative skills that they can carry with them to develop new ideas, enjoy new experience, conquer new challenges, and gain a different perspective, and it also brings personal satisfaction to players and audiences alike.

In the area of instrumental teaching, the approach that each teacher develops with his or her students, both psychologically and in the physiological areas of learning (learning to control tone, intonation, accuracy, and ultimately musical interpretation), has a far flung impact on the development of those students. Many

[1] Laura Ritchie and Aaron Williamon, "Primary School Children's Self-Efficacy for Music Learning," *Journal of Research in Music Education* 59, no. 2 (July 2011), 146–61.
[2] Ibid., 40.

horn teachers focus on the concept of “support” in their pedagogy. This paper explores several aspects of the concept of support, within both the physical and psychological domains. I will describe the many meanings of the term that are implied in horn pedagogy, and then will argue that there is a deep connection between physical and psychological support. I will show how each of these types of support is important to students and speculate on how they are related, proposing a new definition of support as a universal concept for horn playing.

Chapter 1. Introduction

Air is the most important factor in brass playing. Air flow is a crucial element of playing that influences tone production and musical expression. One of the foremost authorities on the subject of breathing for wind instruments, Arnold Jacobs, emphasized the importance of air, stating that while the musical engine is the vibration of the lips, the lips cannot vibrate without wind.[3] Similarly, Philip Farkas states in *The Art of French Horn Playing* that the correct use of the breath is an exceedingly important part of playing a brass instrument.[4] Note that both of these renowned pedagogues finds a word that is different from "air" in these quotes; Jacobs writes of "wind" and Farkas of "breath." Neither, at least here, refers to "support," "air support," or "diaphragm support."

Support as a concept, however, is prevalent in brass pedagogy. The purpose of this study is to explore the meaning of the word "support" in this context, first discovering its many meanings, end then expanding on how important the concept is in every aspect of horn playing. Some support concepts will prove useful, while others will not. The various meanings of support in the physical domain have a profound effect on technique and therefore on tone, intonation, accuracy, and ultimately musical expression. This study aims to examine whether there is a single

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[3] Brian Frederiksen, *Arnold Jacobs: Song and Wind*. (Illiois: Windsong Press, 1996), 122-123.
[4] Philip Farkas, *The Art of French Horn Playing*. (Miami: Sammy Burchard, 1956), 27-30.

concept unifying the various meanings of support, or whether there are, in fact, several disparate strands of thinking behind different technical styles. I will examine the physiology of brass playing and specifically of horn playing, including how embouchure, breath control, and "diaphragm pressure" relate to the concept of support. The paper covers as well the idea of how the definition of support relates to the mental side of support.

The research questions I explore in this paper are as follows:

1. Does it matter whether the concept of "support" agrees with human physiology, or is "support" a metaphor that leads to better playing?
2. Is "support" a cause or an effect? In other words, is "support" something we **do** while playing or something that **happens** while playing correctly?
3. How can the concept of "support" be best explained and best used in pedagogy?

I explore these questions by addressing the relevant literature from each topic and reviewing my personal correspondence and interviews with elite performers that addresses these themes. First, I review the literature on the physical side of support by reviewing how the respiratory system functions. Then, I review the mental sides of playing, drawing on research from music pedagogy and psychology to describe how

support is an important aspect of the development of good musicianship. Finally, I synthesize these ideas to propose a new definition of support and recommend how this new definition can be integrated into music pedagogy.

Chapter 2. Embouchure

An essential component of the physical act of playing the horn is embouchure. The term embouchure describes how instrumental players shape their oral cavity, lips, and related facial muscles when playing a wind instrument.[5] Playing a brass instrument involves moving a stream of air through the lips, which causes the lips to vibrate, which, in turn, creates the sound. The vibration of the air by the lips inside the mouthpiece is amplified by the instrument to produce a beautiful sound. Philip Farkas indicates that correct air use enables the lips to vibrate at different speeds and intensities. He writes that "the vibration of the lips by the air stream is the motivation for the sound produced on the instrument."[6]

Creating a good tone requires a correctly shaped embouchure, with the appropriate use of the facial muscles that control the embouchure. According to Robert Weast, the speed of the vibration of the air is determined by the tension and the shape of the lips and also by the volume of the air in the air stream. The tension of the lips is controlled by the related facial muscles surrounding the lips, the jaw, and the cheeks. The focal point of the embouchure is the aperture, the area where the air passes through the lips. The musculature of the human mouth is exceedingly complicated (think of the range of facial expressions we can exhibit, from smile to

[5] Wayne Bailey et al., *Teaching Brass: A Resource Manual* (Boston: McGraw-Hill, 2008), 4.
[6] Philip Farkas, *The Art of French Horn Playing,* 19.

frown and everything in between), but in essence, the embouchure, in its broad sense, controls the aperture, which itself controls the tone and pitch. Many pedagogues stress the importance of the corners of the mouth in embouchure formation, with control of the mouth corners coming from the cheek muscles. When all of these muscles work closely and correctly together with a steady air stream, the embouchure is in the appropriate shape required to produce a good tone. Maintaining incorrect muscle tension will affect a horn player's intonation and tone quality, not to mention accuracy.

John Fairfield, the principal horn of the Chicago Sinfonietta Orchestra, states in an email interview[7] that embouchure is the air moving past one's lips to create a vibration that is amplified through the horn, ultimately resulting in the sound of the horn itself. A good vibration involves a well-formed embouchure and a steady air stream. Without vibration, there is no sound.

[7] John Fairfield, interviewed by Tsai-Ying Li, Oct.15, 2016.

The influence of vibration speed on pitch

As air passes through the embouchure, the lips vibrate and produce sound. The shape of the embouchure creates tone, but as Fairfield indicates, "it is the speed of the vibration that determines the pitch of the sound produced."[8] Faster vibrations produce higher pitches and slower vibrations produce lower pitches. Pitch is determined by two interacting factors: the aperture of the lips and the speed of the stream of air passing through the lips. In Farkas' book *The Art of French Horn Playing*, the author agrees, stating that "the lips should not actually touch each other in the center of the opening during vibration, but they do vibrate against each other at the sides of the opening."[9] This kind of writing can be rather confusing for students of the instrument.

Although different players, even at the elite level, exhibit different embouchure formations, there are certain commonalities. According to Wayne Bailey, although the shape of the lips and the embouchure can be different depending on individuals, all embouchures share some of the same key characteristics:[10]

1. The oral cavity must be open, with the tongue at the bottom of the mouth.
2. The jaw should be down.

[8] John Fairfield, ibid.
[9] Philip Farkas, *The Art of French Horn Playing,* 19.
[10] Wayne Bailey et al., *Teaching Brass: A Resource Manual* (Boston: McGraw-Hill, 2008), 5.

3. The opening in the lips (aperture) should be oval in shape.
4. The lips should work together but not be pressed together.
5. The mouthpiece should be placed on the lips appropriately: approximately centered, and more on the upper than the lower lip.

David Wakefield, former horn player in the American Brass Quintet, in an email interview, also indicates that "an egg shaped swirl of air at the back of the mouth helps students keep the focus of air by opening the throat and keeping a good steady flow between notes."[11] This image represents an expansion of the idea of keeping an open oral cavity.

Since all horn players' embouchures share the same key traits, there are also some problems that are common for many horn players:

1. The lips are too tense, so the air cannot cause them to vibrate freely. The horn player should play with an open and just-firm-enough shape of embouchure that enables the air stream to flow directly into the instrument while vibrating the lips.
2. The horn player puts too much energy into the embouchure or facial muscles, which does not produce a resonant sound; instead, much of the air passes into

[11] David Wakefield, interviewed by Tsai-Ying Li, Dec.15, 2016.

the horn without causing lip vibration, wasting a player's energy and worsening the tone quality.

3. The player places the mouthpiece on the wrong part of the lips, which, by preventing easy lip vibration, decreases the flexibility and endurance of the lips and changes the pitch and tone quality.
4. The horn player presses his or her lips too closely together, leading to two undesirable consequences: either there is not enough air pressure to cause the lips to vibrate (making the notes less likely to sound) or there is too much and too forced an air stream (making a strident and uncontrollable tone).

Farkas rightly points out that "there are only two functions of our muscles: relax or contract."[12] He argues that there are two main styles of embouchure. The first is the "smiling embouchure," as shown in Image 1. The other is the "whistling embouchure", as shown in Image 2. He argues that embouchures found at both extremes are not ideal, suggesting that players can create a better embouchure by combining both the smiling embouchure and whistling embouchure, which is shown in Figure 3. However, everyone has differences in facial structure, which makes it impossible to precisely define a "correct" embouchure for every player.

[12] Philip Farkas, *The Art of French Horn Playing,* 19. Note that the physiological observations of many writers in their descriptions of technique are often wrong, and Farkas is no exception, though he is right in this case.

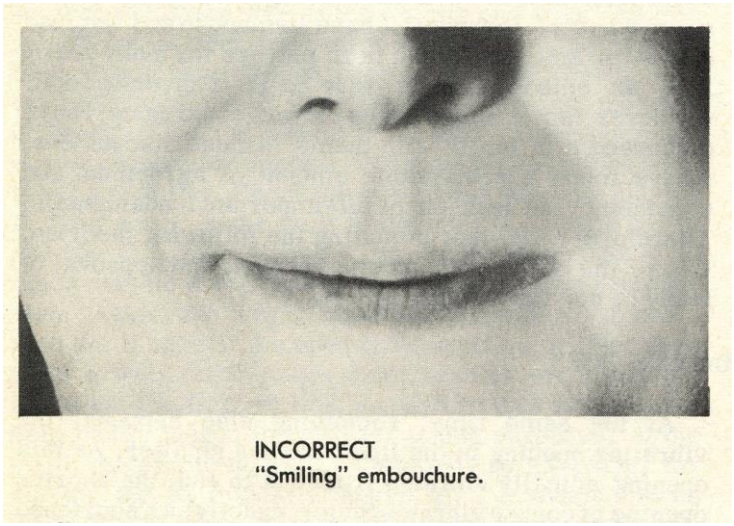

Image 1. Smiling Embouchure[13]

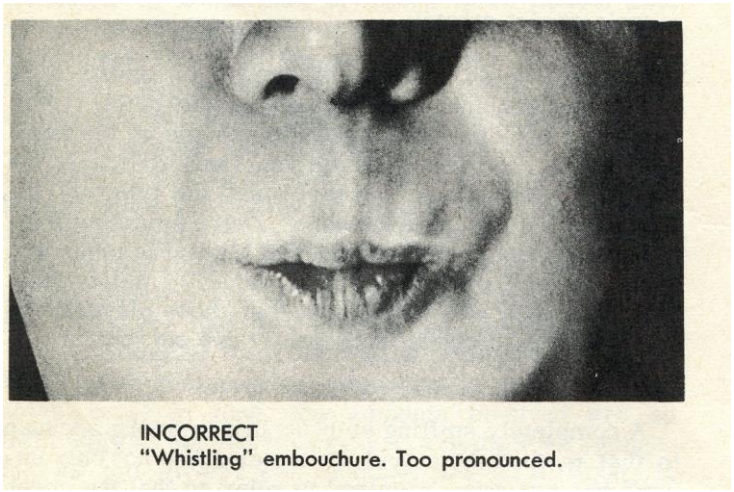

Image 2. Whistling Embouchure[14]

[13] Ibid., 20.
[14] Ibid., 20.

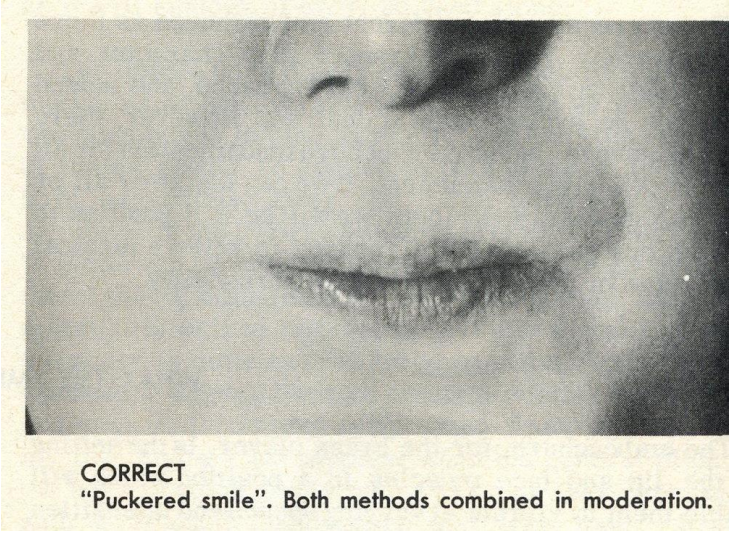

Image 3. Both Methods Combined in Moderation[15]

Farkas's book describes the embouchure largely by describing its outward appearance. From the point of view of the horn student, this can be somewhat confusing – the embouchure, to a horn player, is experienced (felt) largely from the inside. Furthermore, everybody's body (including mouth, teeth, jaw, cheeks, and so on) is different, sometimes radically so. The real pedagogical difficulty lies in first determining and discovering the suitable embouchure for each individual student, and next finding a way to communicate to the student what he or she should do in order to experience the sensation of a good embouchure.

[15] Ibid., 20.

Mouthpiece placement

Proper mouthpiece placement also affects the flexibility of a horn player's lips and thus the ability to produce sound. The horn mouthpiece is extremely small, and there must be room inside the cup for at least some of the upper and some of the lower lip, and indeed room for the lips to vibrate. There is no exact spot which is ideally suited for each horn player's particular mouth. However, Farkas provides a general placement suggestion that he says should be suitable for most horn players. Indeed, in most pedagogy, including that of Farkas, the teacher advises a two-thirds to one-third ratio of upper lip to lower lip placement – that is, two thirds of the mouthpiece rests on the upper lip, and one third on the lower.[16] A proper mouthpiece placement enables horn players to find the center of each pitch, which also helps them produce a good tone. In his article "*Tired of Missing Notes? Work on Intonation*," Daniel Grabois emphasizes that finding the center of the pitch helps horn players improve their intonation, accuracy, and tone quality.[17] Weast also indicates that setting the embouchure position and thinking about the sound of the note before playing can prevent pressure from building up in brass players' embouchures.[18]

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[16] Ibid.,21

[17] Daniel Grabois, "Tired of Missing Notes? Work on Intonation,*" The Horn Call,* Octoer 2016.

[18] Robert Weast, *Brass Performance: An Analytical Text of the Physical Processes, Problems and Technique of Brass*. (New York: McGinnis & Marx, 1965), 20.

The relationship between the word "support" and embouchure

In a well-formed embouchure, the power of the air stream can always be balanced by the strength of the lips to produce an optimal vibration, resulting in a strong and beautiful tone. In such an embouchure, the player can produce notes in any register at any dynamic. I will call such an embouchure a "supported" embouchure, the idea being that the air "supports" or promotes the maximal controlled vibration of the lips. A good embouchure helps horn players create better intonation, tone quality, and sound. In an email interview, John Fairfield discusses the meaning of the word "support," indicating that "the concept of support is related to both the lip tension and air stream, but it is mostly related to the air stream."[19] The embouchure plays an important role in controlling the aperture, which has considerable influence on the vibration speed. Fairfield indicates that "support" is the energy or sustaining force or backing behind the air stream. The lips are facial muscles that can be tensed or relaxed independent of the air. When tensed or relaxed *in conjunction with the air*, a variety of vibration speeds can be created, resulting in different pitches. "Support" therefore refers, for Fairfield, to proper air use in conjunction with the lips.

The opening through which the air leaves the lips and passes into the horn is called the aperture. With a given constant air speed and quantity, a small aperture will

[19] John Fairfield, interviewed by Tsai-Ying Li, Oct.15, 2016.

result in a relatively high pitch and a larger aperture will result in a relatively low pitch. Typically, for high pitches, one uses a smaller aperture while blowing a faster stream of air[20] (note that, as Fairfield points out above, the air must always balance or work in conjunction with the lips). For loud high notes one uses a larger amount of fast air along with a slightly larger aperture. For quieter high pitches, one uses an even smaller aperture with a smaller quantity of fast air. To play low pitches one's aperture needs to be larger, and the quantity of air needs to be varied according to the volume of the sound desired. A larger quantity of air should produce a larger quantity of sound. Having a "well-supported embouchure," with air passing correctly through the aperture, will produce a beautiful tone and will additionally give the player control over pitch and dynamic.

[20] Note that the concepts of "fast air" and "slow air" are directly related to air pressure. That is, when the aperture is small, the air blown into the horn will encounter greater resistance, and will therefore be placed under greater pressure. The result, as the air travels into the horn, is greater air speed.

Chapter 3. Breath Control

Proper use of the respiratory system is an important factor for brass players because air, passing through the lips, creates sound. When learning a brass instrument, breath control (the ability to control the power and direction of the exhalation) is one of the main challenges for new students. Good breath control enables players not only to create a good sound with their instruments, but to shape the melody in order to create musical phrases. According to Karin Harfst, "Correct breathing is an essential requirement to good performance because it affects every aspect of tone production and musical expression."[21]

Breath control involves using the respiratory system, consisting of inhalation and exhalation. When inhaling, the diaphragm contracts and the ribs expand, allowing air to fill the lungs. When exhaling, air is gently forced from the lungs as the chest cavity returns to its lesser size and the diaphragm returns to its relaxed position. Robert Weast, in his *Brass Performance,* argues rightly that air is a very important factor that influences tone production and intonation.[22] Philip Farkas goes even further, arguing that horn players should employ abdominal pressure to push the air out, since exhalation when performing is different from normal exhalation.[23]

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[21] Karin Harfst Sehmann, "The Effects of Breath Management Instruction on the Performance of Elementary Brass Players," *Journal of Research in Music Education* 48, no. 2 (July 1, 2000), 136-37.
[22] Robert Weast, *Brass Performance: An Analytical Text of the Physical Processes, Problems and Technique of Brass*. (New York: McGinnis & Marx, 1965), 23.
[23] Philip Farkas, *The Art of French Horn Playing,* 28-29.

The concept of "breathing from the diaphragm" has traditionally been the instruction of choice in mainstream brass pedagogy, though exactly what that means can be a matter of some confusion to beginners and even to more advanced players. Indeed, the diaphragm contracts on its own, whether or not abdominal pressure is applied. Weast suggests that a more powerful image is to try "to breathe deeply and expand around the waist."[24]

Breath control requires more energy than simply taking a deep breath, not only because the player must take that breath in a much shorter time than is typical when not playing an instrument, but also because the player must sustain the increased output of air for much longer than during normal breathing.

According to Weast, the most common problem young brass players have with breathing is that they tend to raise their shoulders or tense their upper chest to breathe. Both of these behaviors waste energy. With tension in the upper body, it is difficult to expel all the air that was inhaled, making for inefficient air management. The next inhale, taken with air still present in the lungs, becomes less full, creating a vicious cycle that negatively affects tone quality, intonation, and musical phrasing.[25] Therefore, he suggests that brass players should use all of the air in their lungs to play

[24] Robert Weast, *Brass Performance,* 20.
[25] Robert Weast, *Brass Performance: An Analytical Text of the Physical Processes, Problems and Technique of Brass*. (New York: McGinnis & Marx, 1965), 19-21.

each phrase so they are out of breath by the end of the phrase.[26] By doing this, a brass player can sufficiently control the amount of air needed to express emotion and shape the musical phrases, according to Weast.

Similarly, Philip Farkas argues that brass players should breathe deeply to get as much air as they need, which helps the diaphragm sustain and maintain a steady air stream.[27] Farkas argues that both inhalation and exhalation are performed by the diaphragm, allowing the lungs to fill to the very bottom and then exhaling the air.[28] To play an instrument, brass players have to first inhale deeper than during ordinary breathing. To do this, he suggests that horn players pull their diaphragms down to enlarge the space for air. Then, they should maintain the air pressure by contracting the diaphragm and pushing the abdomen forward. The pressure caused by pushing the abdomen forward helps expel the air when playing the horn. According to Farkas, in normal exhalation, people relax their diaphragm and abdomen so the air is gently forced from the lungs. He uses the term "diaphragm pressure" to describe when the pressure from the diaphragm maintains a steady flow of "well-supported" air through the horn.[29] He argues that deep breaths are taken by continually contracting the diaphragm, gently pushing away from the abdomen, and expanding the ribs outward.

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[26] Note that this pedagogical idea lies somewhat out of the mainstream.
[27] Philip Farkas, *The Art of French Horn Playing,* 28-29.
[28] Note that, as pointed out above, he is incorrect on the anatomy, as the diaphragm is engaged only in the act of inhalation.
[29] Philip Farkas, *The Art of French Horn Playing*, 29.

To fill the lungs quickly, the player needs to take a deep breath by contracting the diaphragm at the same time. In his book "*The Art of French Horn Playing*," he explained[30] three core concepts of correct breathing:

1. A deep inhalation involves diaphragm contraction, abdominal or waist expansion, and rib expansion working closely together at the same time.
2. An exhalation involves pressure: the contraction of the abdomen and waist muscles from the bottom of the diaphragm.
3. Resistance is a necessary condition for creating pressure, so the resistance and the air pressure work together to help control the musical phrases.

According to Farkas, these steps taken together define breath control, a process that is not automatic. Learning to automate the process requires extensive practice.[31]

The workings of the respiratory system are now much better understood. Farkas' emphasis on the diaphragm as the controlling muscle of exhalation is incorrect. His pedagogy is easier to understand when his use of the word "diaphragm" is conceived as "abdominal musculature." Furthermore, as my interviews, described below, make clear, this more old-fashioned emphasis on manipulating the muscles of the abdomen

[30] Philip Farkas, *The Art of French Horn Playing*, 30.
[31] Ibid, 30.

has given way to a more relaxed conception of breath control.

Although knowing how the body works when playing the horn can be beneficial to horn players, Daniel Grabois and John Fairfield both argue that it would be better to focus more on the music itself instead of thinking about the intricacies of muscle physiology.[32] In a personal interview, Professor Daniel Grabois of the University of Wisconsin-Madison states that instead of thinking about breath control and how muscles work in the respiratory system, it is better to imagine how it would feel to sing the musical phrases when performing. Indeed, many teachers today focus on the act of singing as the defining metaphor for air production, and specifically air exhalation. The singing metaphor is so powerful because when players think about singing, it provides them with an intuitive sense of phrase and shape. This is a more natural approach compared to thinking about which muscles to use and how much air to use.

Similarly, in an email interview, John Fairfield agrees that "players rarely think about these fairly complicated processes when they play the horn because of the many hours already spent playing and practicing over many years."[33] Players are constantly changing lip tension and aperture while simultaneously changing the quantity and the speed of the air, all without much conscious thought. Thus, breath control, inhalation,

[32] Daniel Grabois and John Fairfield, interviewed by Tsai-Ying Li.
[33] John Fairfield, interviewed by Tsai-Ying Li, Oct.15, 2016.

exhalation, and the use of diaphragm (or abdominal) pressure should occur without thinking too much while performing.

Arnold Jacobs also recommends two strategies for breath control in his pedagogy.[34] He argues that to play a brass instrument successfully, players should take a sufficient quantity of air into the lungs and make efficient use of it when blowing the air through the instrument. He also indicates that imagining the sound before blowing into the instrument can help musicians to produce a better sound (note the parallels here to the notion of singing described above). To illustrate this, he gives an example about driving cars. Drivers do not need to analyze every aspect of the car's engineering while driving. It is the same with music. He states that "during a concert it is not the time for the musician to analyze the mechanics of breathing; it is time to perform."[35]

John Fairfield also mentions that there are differing schools of thought regarding how to breathe. Some instructors teach students that they should hold their stomach up and in, while others teach them that they should push the stomach down and out or that they should fill their lungs in three stages. Fairfield argues that since we have all been breathing since we were born, horn players do not need to be instructed in how

[34] Gregory Irvine, "Spotlight on Brass: Arnold Jacobs' Pedagogical Approach to Brass Performance: An Overview," *Canadian Winds: The Journal of the Canadian Band Association* 7, no. 2 (Spring 2009), 86–88.

[35] Brian Frederiksen, *Arnold Jacobs: Song and Wind*. (Illiois: Windsong Press, 1996), 93.

to breathe. He also suggests that if horn players need to learn anything about breathing, it would be how to inhale efficiently, which involves opening the jaw sufficiently to allow as much air into the lungs as quickly as possible while maintaining a good embouchure.

Fairfield also notes that "even though students are sometimes taught to prevent their shoulders from moving when inhaling, this can be problematic."[36] When taking a big breath, for horn playing or swimming, the intent is to fill the lungs with air which then expands the chest, from front to back, side to side, and top to bottom (the lungs reside in the chest, surrounded by the ribs). Preventing the shoulders from moving at all can create rigidity in the chest, blocking the lungs from filling completely, which further inhibits efficient breathing. Fairfield recalled what he learned in his studies with Dale Clevenger, former principal horn of the Chicago Symphony Orchestra: "Dale Clevenger often used the image of fuel in connection with breathing. One's air was the fuel that runs the machine. If one wants a large hot fire, one needs a large amount of fuel. Or for a small fire a smaller amount of fuel. If one is to drive a vehicle for a long distance more fuel is needed than for a shorter trip. Mr. Clevenger was always encouraging the use of more fuel."[37]

[36] John Fairfield, interviewed by Tsai-Ying Li, Oct.15, 2016.
[37] John Fairfield, interviewed by Tsai-Ying Li, Oct.15, 2016.

To sum up, the type of breathing needed to play an instrument is not the same as everyday breathing. However, Arnold Jacobs states, "When I am investigating respiration, I wear an investigator's hat. When I am teaching, I wear a teacher's hat. When I put on the performer's hat, I am not concerned with the mechanics of breathing."[38] Focusing on contracting the diaphragm muscles does not necessarily lead to well-supported breath control; instead, such breath control is based on imagination of musical ideas and efficient breathing. Musicians can manage their breath control by simply thinking about musical ideas and musical phrases, metaphorically singing through the instrument, shaping an appropriate embouchure, matching the "blow" to the embouchure, and breathing efficiently. Well-supported breath control helps horn players shape their musical melodies more beautifully and allows their diaphragms and abdominal muscles to engage naturally.

[38] Brian Frederiksen, *Arnold Jacobs: Song and Wind*. (Illiois: Windsong Press, 1996), 93.

Chapter 4. Diaphragm Pressure

In *The Art of French Horn Playing*, Philip Farkas points out that "the diaphragm is a strong and resilient muscle that lies across and through the waist."[39] When people play wind instruments, they should breathe in as much air as they can. During inhalation, the diaphragm descends, drawing air into the lungs until the player blows that air out through the instrument.

When talking about using the air as a support in playing, the term "diaphragm pressure" is sometimes confused with support – indeed, Farkas uses the terms essentially interchangeably. Frank Lloyd, in an interview with the author, indicated that "the confusion behind the meaning of 'support' is not surprising since the diaphragm and abdomen both work closely together."[40] The diaphragm supports the airflow; the air needs the support structure to enable us to stay in control. The freedom to do this comes from moving the "workload" into the abdomen and out of the throat, according to Lloyd. Note that this profusion of technical description is used in the service of providing greater relaxation to the throat. Lloyd also mentions that technically speaking, the term "support" describes the constant control of the air pressure in the chest by engaging certain muscles that modify the air pressure. Technical descriptions such as this can prove nettlesome for students and professionals alike.

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[39] Philip Farkas, *The Art of French Horn Playing*, 28-29.

[40] Frank Lloyd, interviewed by Tsai-Ying Li, July 23, 2016.

The diaphragm is in fact a large, dome-shaped muscle that separates the abdominal and chest cavities.[41] During inhalation, the lungs expand to take in air while the diaphragm contracts, descending. The diaphragm relaxes during exhalation, returning to its dome shape and reducing the volume of the chest cavity.

Image 4 illustrates this process.[42] The rib cage expands upon inhalation. In contrast, when air is exhaled, the lungs get smaller, the diaphragm relaxes, and moves upward, and the rib cage contracts.

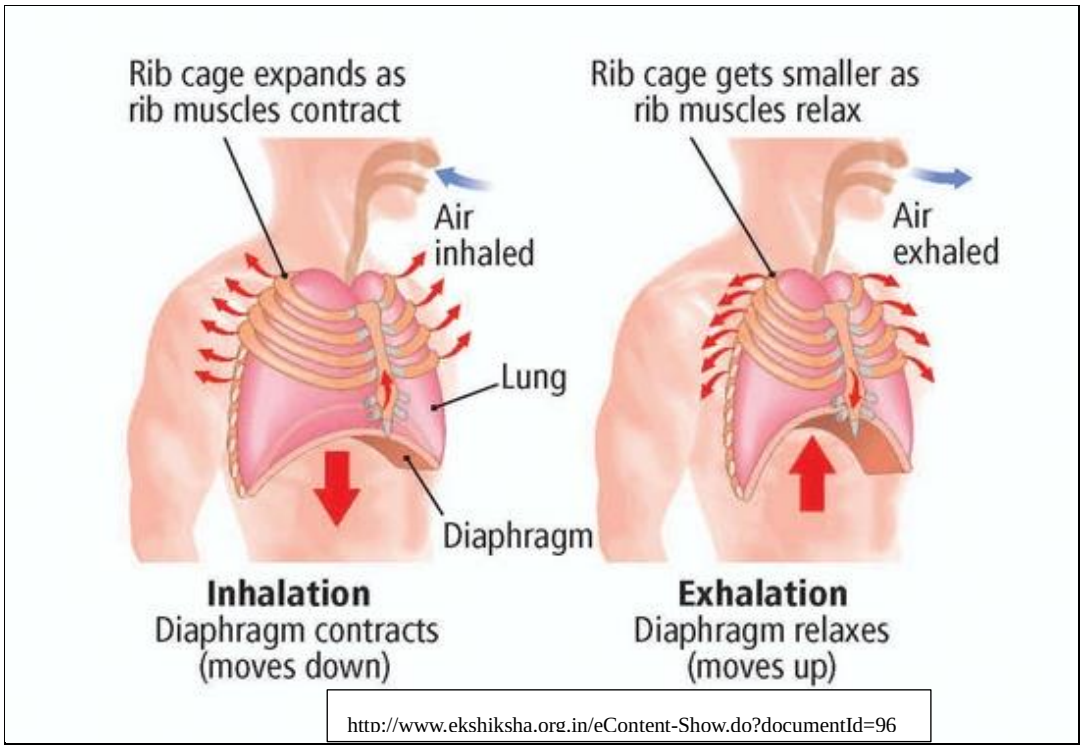

Image 4. Respiration

[41] Kenneth W. Berger, "Respiratory and Articulatory Factors in Wind Instrument Performance," *Journal of Applied Physiology* 20, no. 6 (November 1, 1965), 1217–21.
[42] Ibid.

The diaphragm and abdominal muscles work together and in sequence in an organic respiratory process. Even though the air is expelled quickly in everyday breathing, putting pressure on the abdominal muscles can cause *less* efficiency when playing the horn. As Daniel Grabois states, squeezing the abdominal muscles creates tension in the throat and throughout the upper body, impeding efficient respiration. One of Grabois' early teachers asked him to lie down on the ground, and, pushing his boot on Grabois' stomach, asked him to resist this pressure by engaging his stomach muscles. The teacher said that this resistance is required for support.

Throughout the interviews conducted for this report, such teachings were seen to have been rejected by modern pedagogues.

Resistance

Resistance is another key factor in brass performance. Proper use of resistance allows players to maintain a steady air stream and to efficiently control the air in order to produce the desired tone at the desired dynamic. But where is this resistance to be located? Farkas indicates that "pressure from the diaphragm requires something to push against."[43] For example, if there were no resistance between the lungs and the end of the instrument, even minimal pressure put on the diaphragm would send the air

[43] Frank Lloyd, interviewed by Tsai-Ying Li, July 23, 2016.

from the lungs rushing out in a short burst past the end of the instrument.

This is a puzzling formulation, and Farkas does come back to the notion of resistance provided by the embouchure (it is one of his "four points of resistance,"[44] the other points being the lip aperture, the mouthpiece, and the throat or larynx). Unlike in normal exhalation, blowing into the horn requires a regulated air stream to prevent all the air from being pushed out too quickly. This regulation comes from the well-shaped embouchure, and in particular from the small opening of the aperture. Employing a correct embouchure, horn players can maintain and sustain their air stream to shape the musical phrases.

Farkas finds the locus of resistance more in the "diaphragm" (abdominal muscles) than in the lips. He points out, for instance, the particular difficulty playing *pianissimo*, offering that diaphragmatic support provides the resistance that prevents the sound from blurting out loudly. Note that physiologically, pressing on or squeezing the abdominals tends to close the throat, which does in fact decrease the amount of air leaving the body. It is a shame that Farkas is no longer alive, as further discussion of this idea with him would have been fascinating.

It seems that part of our ability as humans is to control how hard we blow simply by deciding … how hard to blow, without thinking about the mechanism, the "how-to."

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[44] Philip Farkas, *The Art of French Horn Playing,* 29.

While it is clearly the case that our body responds differently depending on the violence of our blowing, we do not need to try to regulate our muscles. It is enough simply to blow soft or hard. In many of the written and oral descriptions encountered during this research project, the question often emerged: is the body's muscle use a *cause* of good horn playing, or a *response* to good horn playing. Many horn players and teachers instruct their students to blow from the diaphragm, often using the terms "diaphragmatic support" or "diaphragm pressure." This suggests maintaining active control over the abdominal muscles, and labels such control "support." The more up-to-date pedagogy recognizes that the abdominals will engage during the act of blowing air; in this conception, "support" would describe the entire process of moving air past a well-constructed embouchure, rather than the specific engagement of the abdominals (misunderstood as the diaphragm).

Use of air

Keith Johnson, in his book *Brass Performance and Pedagogy*, states that good breathing is as necessary as the life of the sound.[45] He always asks his students to inhale with the word "OH," and blow the air out with a free-flowing column. He makes his students consider the difference between air and air power. Johnson

[45] Keith Johnson, *Brass Performance and Pedagogy* (Prentice Hall, 2002),25.

believes that the word "support" can cause misunderstanding for players, causing them to try to blow harder. If a player blows harder, it causes unwanted pressure, tension, and restriction of airflow. Similarly, Arnold Jacobs argues that "the blowing of the breath should be the support, not tension in the muscles of the body, but the movement of air that is required by the embouchure."[46]

John Fairfield indicates that "when playing, musicians inhale and exhale just as during every other every time they breathe."[47] In other words, there is no separate *technique* for breathing while playing the horn. Air flows into the lungs and then air flows back out. The human body takes care of this naturally without requiring conscious thought. The difference between everyday breathing and breathing while playing the horn is that horn players often need to inhale quickly and then exhale very slowly, depending on the demands of the music at hand. Efficiency in inhaling and control in exhaling are essential skills in horn playing. Fairfield states, rightly, that when the lungs are full, less energy is needed to expel the air. When the lungs are almost empty, the player's abdominal muscles are further engaged as the air is pushed out. Therefore, taking a deep breath and managing the air sufficiently are important for horn players, especially since the sound stops once there is no air left in the lungs.

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[46] Brian Frederiksen, *Arnold Jacobs: Song and Wind*. (Illiois: Windsong Press, 1996), 122-123.

[47] John Fairfield, interviewed by Tsai-Ying Li, Oct.15, 2016.

Note the contrast here with Weast's position, stated above, that horn players should only breathe the amount of air needed for a given phrase.

Fairfield argues[48] that there is muscular work involved during the blowing process, which he calls "support." He noted that although there are many ways to describe the concept of support, such as breathing from the stomach or breathing from the diaphragm, these are not valid since humans breathe into the lungs. Therefore, Fairfield believes that these concepts are probably intended to create the *images* of breathing deeply while remaining relaxed, instead of putting extra pressure on the diaphragm while playing the horn. Daniel Grabois agrees[49] that pushing hard on the stomach muscles will make the throat tense, and once the throat becomes tense, the tone deteriorates. To avoid any extra tension, Grabois suggests teaching players to "sing the air," that is, to replace the concept of "blowing" with the concept of "singing," which helps horn players interpret their musical ideas in a more organic way rather than through technical instructions.

Although some teachers and horn players still teach that support is achieved by putting pressure on the diaphragm or by pressure from the stomach muscles to produce the sound, this instruction leads to misunderstanding about the use of muscles.

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[48] John Fairfield, interviewed by Tsai-Ying Li, Oct.15, 2016

[49] Daniel Grabois, interviewed by Tsai-Ying Li, Feb.24, 2017.

Therefore, concentrating on the use of air in the appropriate way (in balance with the embouchure) will help horn players perform better.

Chapter 5. The Mental Side of Support

Teaching and performing are both essential parts of the art of music. Cultivating positive thinking and possessing self-efficacy (according to psychologist Albert Bandura, "self-efficacy" is a belief in one's ability to succeed in specific situations or to accomplish one's goal[50]) are all required for musicians and teachers to efficiently develop their musical knowledge and succeed in their goals.[51]

Arnold Jacobs, the former principle tuba player for the Chicago Symphony Orchestra, claims that his approach to teaching was in a constant state of change throughout his career. He always sought the best approach for each individual student, and derived his method by integrating personal research in the areas of physiology and psychology with his extensive teaching experience. He taught students to concentrate on the music first and to reserve technical thinking for situations that absolutely required it. In the book *Arnold Jacobs: Song and Wind*, the author, Brian Frederiksen, states that Arnold Jacobs taught his students that beautiful thinking will lead to beautiful playing: "For it is what you have to say in music that determines the quality of your performance."[52] Arnold Jacobs also believed that "The greatest problem for an orchestral player is not to perform his own part, but to adjust himself

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[50] Albert Bandura, "Self-Efficacy: Toward a Unifying Theory of Behavioral Change," *Psychological Review* 84, no. 2 (1977), 191–215.

[51] Siw G. Nielsen, "Strategies and Self-Efficacy Beliefs in Instrumental and Vocal Individual Practice: A Study of Students in Higher Music Education," *Psychology of Music; Manchester* 32, no. 4 (October 2004), 418–31.

[52] Brian Frederiksen, *Arnold Jacobs: Song and Wind*. (Illiois: Windsong Press, 1996), 137-138.

to the others. He must know the score and sense his own position in the music as a whole."[53]

Many research studies have shown that how people think is important to determining how they act. Based on these studies, being a good brass player not only involves knowing how to use air in the physical process of playing (air, lips, abdominal musculature, and so on), but also how to conceive beautiful thoughts or "imaginings" about music.

Positive thinking

Having positive thinking or a positive attitude makes people more excited to complete complicated tasks and goals, and more competent as well.[54] For example, an effective teacher would create a positive and nurturing atmosphere, and this environment would in itself be an integral motivator in the student's learning. However, a teacher with a negative attitude could cause students to think negatively, which could not only decrease a student's interest and motivation for playing the horn, but could even cause harm to that student's technique and musicianship. In other words, a negative atmosphere could influence a student's actual performance. Indeed, Keith Johnson believes that good musical training alone may not be enough to

[53] Brian Frederiksen, *Arnold Jacobs: Song and Wind*. (Illiois: Windsong Press, 1996), 95.
[54] John McCormick and Gary E. McPherson, "Self-Efficacy and Music Performance," *Psychology of Music; Manchester* 34, no. 3 (July 2006), 322–36.

produce an effective teacher.[55]

According to Carolyn Christie, the second flute of the Montreal Symphony Orchestra since 1978 and faculty member at McGill University, "developing a good imagination helps musicians succeed."[56] She indicates that practicing the use of one's imagination and practicing how to concentrate are both important to musicians' auditions and performances. These skills can be practiced every day in addition to playing skills. Christie also mentions that building positive thinking helps students face and get through stressful situations. In her studio class, she asks her students to reframe their concerns using a positive frame of reference. For instance, instead of saying, "I am afraid of my endurance problem for the solo recital," it would be better to say "I am so excited to have this chance to share my music with audiences and I would like to take this challenge for my endurance training." The second sentence is more energetic and inspiring, and is more likely to lead to not only a successful performance but a more successful practice routine in general.

According to Christie, "if you give your all, you will have no regrets."[57] She suggests three steps to achieving a goal: planning, action and evaluation:

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[55] Keith Johnson, *Brass Performance and Pedagogy* (Prentice Hall, 2002), 6.
[56] Carolyn Christie, "Mental Skills Coach for Performance and Educators-Using Imagery for Performance Success" (presentation, International Horn Symposium, New York, NY, June 13-18, 2016).
[57] Ibid.

Planning	Set up a goal. It could be a long-term or a short-term goal.
Action	Practice "focus." Focus on the beauty of the sound. Practice every day.
Evaluation	After a week, adjust the schedule and continue with practicing.

In other words, one's practice routine, while always in flux and subject to new evaluation, is saturated in the positive rather than festering in the negative.

According to Professor Tom Curry of the University of Wisconsin-Madison, "our brain is like a computer program."[58] We have ideas and information about music, just like a computer that stores and processes information. But mere possession of the information does not guarantee a good performance. We have all the musical ideas and information in our brains about how to present a piece, but we have to actually execute (perform) the music.

I observed Professor Curry teaching a euphonium lesson at the University of Wisconsin-Madison in which the student was playing a piece for his jury. The piece contained many running notes, but these notes were not clear. The student thought the problem was his lips and air, but Professor Curry asked the student to take away his euphonium and play using a visualizer.[59] The student could play all the notes clearly with his visualizer, and thus there was no problem with his lips or air. After Professor

[58] Tom Curry, private lesson observation, Madison, WI, 2015.
[59] A visualizer is a mouthpiece rim attached to a short metal stick. The embouchure can be seen through the visualizer.

Curry pointed this out, the student played better when he returned to the euphonium. What the student had lacked was not the requisite technique, but rather the *confidence* in his technique, and Professor Curry used the visualizer to demonstrate the student's competence. Professor Curry told the student that the brain is like a computer program in the sense that sometimes we cannot play the fast running notes because of our brain, not because of our fingers. According to Professor Curry,[60] when our brain is clear and knows what to do, performing is just like turning on the power button. Once the skills and techniques (notes, phrases, dynamics, colors, articulations, and so on) are written in the "computer," all the performer needs is good, healthy, positive thinking.

In my experience, thinking is indeed the biggest part of performing. For example, before I came to UW-Madison, I loved to play the horn but I was sometimes afraid of playing high notes. However, Professor Grabois[61] taught our horn studio that if we think "this is hard," then we have already put in place an obstacle. If instead of thinking "this is hard," we can think "I can do this," we play better. This kind of simple positive thinking also helps instill a good attitude, which makes it easier to set goals, and to continue to strive to achieve those goals. Because of this lesson, I began to play as many high notes as I could. I am now no longer afraid of making mistakes because I made so many, and learned from every one of them. The more I engaged with my

[60] Tom Curry, private lesson observation, Madison, WI, 2015.
[61] Daniel Grabois, private lesson observation, Madison, WI, 2015.

high register, the more comfort and confidence I found for those notes. I went from a vicious cycle (miss a few notes, develop fear, miss a lot more notes, develop a lot more fear) to a virtuous one (play high, hit a few good notes, figure out how I did it, play more high notes, feel better, play better). This has helped my accuracy tremendously.

As Professor Grabois taught, when students achieve a good result using a particular technique, they must continue to play in that way: practicing means playing *correctly* over and over. However, if students only play until they get it right the first time, they have in essence practiced in the wrong notes.

Self-efficacy

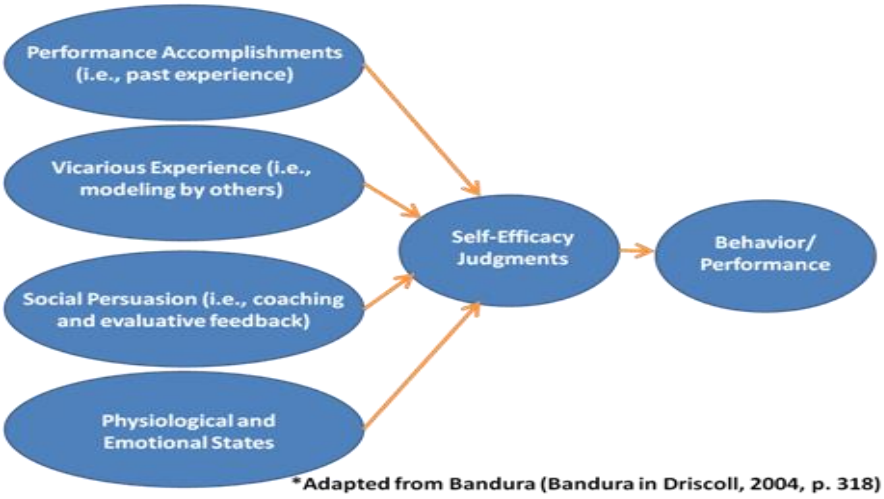
Self-efficacy plays an important role for musicians to achieve their goal of delivering the beauty of music for audiences and students. Self-efficacy is concerned with people's belief in their own ability to achieve or succeed. Albert Bandura argues that many studies have shown that self-efficacy can have a powerful effect on how people think, feel, and behave[62] - let us add "perform" to that list. Bandura notes that how people think affects how they act.[63] For example, people with high self-efficacy

[62] Barry J. Zimmerman, Albert Bandura, and Manuel Martinez-Pons, "Self-Motivation for Academic Attainment: The Role of Self-Efficacy Beliefs and Personal Goal Setting," *American Educational Research Journal* 29, no. 3 (January 1, 1992), 663–76.

[63] Albert Bandura and Dale H. Schunk, "Cultivating Competence, Self-Efficacy, and Intrinsic Interest through Proximal Self-Motivation," *Journal of Personality and Social Psychology* 41, no. 3 (1981), 586–

will focus on how to find a solution to solve the problems: positive thinking. He goes on to note that people with a lack of self-efficacy will concentrate on their own deficiencies, questioning their abilities to solve problems, which is a negative attitude.

An individual's self-efficacy, however, is not the same in all situations. For instance, one person might have strong self-efficacy in the music field, but low self-efficacy in the business field (a common condition among musicians!). In addition, self-efficacy in a particular area is not fixed, but can be developed or cultivated (or harmed), influencing later behavior and performance.[64] Bandura provides the following four principles that influence self-efficacy beliefs:[65]



98.

[64] Nielsen, "Strategies and Self-Efficacy Beliefs in Instrumental and Vocal Individual Practice," 1-14.

[65] Zimmerman, Bandura, and Martinez-Pons, "Self-Motivation for Academic Attainment," 1-14.

- **Performance accomplishments** can include not only successful performances but good practice sessions, rehearsals, and so on.
- **Vicarious experiences** can include concert attendance, listening to recordings, and experiencing the playing of colleagues in ensembles. This kind of modeling is ever-present in the music world, especially today's internet-enabled world.
- **Social persuasion (verbal persuasion)** includes lessons with a teacher, chamber music coaching, words from conductors, and even evaluation from colleagues.
- **Physiological and emotional states** refer to one's perception of one's own ability to succeed in a task. This is the most complex principle, involving one's self-perception and judgment, and folding in one's thoughts about how one is viewed by others as well. Note that emotional states (e.g., anxiety or stress) can have a huge impact on a musician's perception of whether he or she can accomplish a technical (physical) task.

According to this model, these four principles are the key, interrelated factors that affect musicians' performance and behavior. The important point is that a musician's state of mind and past experience in these areas can affect his or her actual technical execution on an instrument.

Chapter 6. Interviews

For this study, I conducted five interviews with well-known musicians and professors of horn. Our topic was the concept of "support." This section summarizes their perspectives on teaching the concept of support to their students.

Frank Lloyd

Frank Lloyd[66] indicated that "the confusion of the meaning of 'support' is not surprising as the diaphragm and abdomen both work closely together. The diaphragm supports the airflow and the air needs the support structure to enable musicians to stay in control, and achieve the freedom that comes from getting the airflow into the abdomen and not in the throat." He also said that, technically speaking, the term "support" describes the constant control of the air pressure in the chest by engaging certain muscles that modify the air pressure:

With more air pressure (faster air), the sound is louder.

With less air pressure (slower air), the sound is softer.

He noted that every sound and every phrase must be supported by the breath, which engages the abdominal muscles. In addition, the rib cage is flexible to enable it to expand with the intake of breath. He also believes that good support is based on the

[66] All information in this section taken from personal interview, Frank Lloyd, interviewed by Tsai-Ying Li, July 23, 2016.

awareness, use, and control of the muscles of the lower abdomen, including the diaphragm. The diaphragm contracts when breathing in, and other muscles of the lower abdomen work to control the exhalation. Breathing out can work on its own (as when we sleep), but horn players need to control the air so that they can maintain the desired air pressure they need depending on the dynamics, articulation, and required tone of the music. In addition, Lloyd noted that the last half of the air in the lungs needs to be actively pushed out since it will not come out on its own.

Lloyd also mentioned that it is important for the air to have an undisturbed path to the embouchure. Impediments to this path include a tight throat, the tongue pushing upwards, or the tongue staying too high after articulation. By maintaining an undisturbed and clear air path, horn players can produce the full resonance and color of the sound. He also argued that one key element in breathing is actually not support, but the reverse – release − which horn players need to do every time they breathe in, before re-engaging the air support during exhalation.

However, a problem with good air support comes from being nervous. Once performers become nervous, tension will increase. Once tension increases, performers have less efficient breath. Inefficient breath, in turn, makes notes less likely to sound because of the lack of air support. Therefore, Lloyd argued that players must always maintain an active support system.

Dale Clevenger

In an interview with Professor Dale Clevenger,[67] former principal horn player with the Chicago Symphony Orchestra, about the word "support," he mentioned that he does not use the word "support" in his teaching or performing because it can easily cause confusion for students. He suggested that the word "sustain" is a better word to describe horn performance. In addition, he stated that too many players think excessively about the physical aspects of playing, but he chooses "to concentrate and stress the ARTISTIC, the MENTAL aspects of performance." In his teaching, he uses the image of fuel in connection with breathing, describing air as the fuel that runs the machine. If one wants a large hot fire, one needs a large amount of fuel. Or for a small fire, one needs a smaller amount of fuel. If one is to drive a vehicle for a long distance, more fuel is needed than for a shorter trip. Clevenger always encourages the use of more fuel.

[67] All information in this section taken from personal interview, Dale Clevenger, interviewed by Tsai-Ying Li, September 24, 2016.

David Wakefield

According to David Wakefield,[68] horn professor at The Hartt School and former hornist in the American Brass Quintet, air flow is a very important aspect for a horn player, but he could not describe air flow in one word. He mentioned that if the focus of "support" is in the torso, it is possible that a strong push from the abdominal muscles might also lead to a tightening of the throat. Wakefield, like Arnold Jacobs, believes that the process of a strong push from the stomach muscles is less effective for a brass player.

Wakefield stated that he has found that the most effective method in his teaching is to use imagery. He encourages his students to think of maintaining an egg-shaped swirl of air in the back of the mouth, in the area of the soft palate, to help keep the throat open. This swirl of air also helps to keep a steady flow of air between notes in order to cut down the "wawa" sound when students play lyrically. He pointed out that the shape of the egg can be different as the range varies so the front of the mouth is shaping vowels to support high and low playing, but the back of the mouth is maintaining either a more rounded egg (in the low range) or a more pronounced egg (in the high range). Using this visualization of an egg shaped swirl of air, students will focus more on their air flow.

[68] All information in this section taken from personal interview, David Wakefield, interviewed by Tsai-Ying Li, December 15, 2016.

John Fairfield

According to John Fairfield,[69] air moving through and past one's lips creates a vibration that is amplified by the horn. Without vibration there is no sound. He stated that the speed of the vibration determines the pitch. Faster vibrations produce higher pitches and slower vibrations produce lower pitches. The pitch (or frequency) of the sound is determined by the amount of lip tension and the speed of the stream of air going through the lips. He indicated that the concept of support is related to both lip tension and the air stream, but he argued that it is mostly related to air stream. Fairfield said that support is the energy or sustaining force or backing behind the air stream. The lips are facial muscles that can be tensed or relaxed independent of the air. Using tension or relaxation, a variety of vibration speeds can be created resulting in different pitches. He mentioned that the size of the aperture, the opening between the lips for the air to escape, also controls pitch. For example, a small aperture will produce a relatively high pitch and a larger aperture will produce a low pitch.

Fairfield explained that typically for high pitches, one uses a smaller aperture while blowing a faster stream of air. For loud high notes, one uses a larger amount of fast air along with a slightly larger aperture. However, for quieter high pitches, one would use an even smaller aperture with a smaller quantity of fast air. To play low

[69] All information in this section taken from personal interview, John Fairfield, interviewed by Tsai-Ying Li, October 15, 2016.

pitches, one's aperture would be larger, varying the quantity of air according to the volume of sound needed. A larger quantity of air should produce a louder sound.

Fairfield argued that horn players rarely think about this complicated process because of the many hours they have spent playing and practicing through many years. He stated that if players need to learn anything about breathing, it is efficient inhaling as quickly as possible into their lungs while maintaining a good embouchure.

Fairfield shared a further thought regarding “how to.” He mentioned that students are sometimes taught not to “move their shoulders when breathing.” However, this can be problematic. One takes a big breath in order to fill the lungs with air, but preventing the shoulders from rising can create rigidity in the chest, which inhibits free and efficient breathing.

Finally, Fairfield suggested that horn players tend to be more fixated on their lips and/or embouchure, but it is the air that makes the machine work. In general, Fairfield believes that it is best to try to keep things simple. He suggested that the best way to play the horn is to play with a beautiful sound and to play musically.

Daniel Grabois

Daniel Grabois explained[70] the reason he does not use the word "support" in his teaching by sharing his own experience. He said that when he was in 7th grade, the first thing his teacher taught him was support. His teacher asked him to lie down on his back on the ground, and the teacher put his boot on Grabois' stomach and pushed. The teacher said, "Resist and push it back." Then, Grabois resisted with his abdominal muscles and pushed back. The teacher said, "That is 'support;' that is how you have to play." Although Grabois practiced this concept through high school, he never knew why the teacher asked him to do that. In high school, the teacher always said "support the phrases, support the music." How can the player shift from high to low register? Support. How can the player negotiate the high register? More support. The answer to all questions was "more support."

Although his college professor did not talk a lot about technique, Grabois remembered one lesson. Grabois said to his teacher, "You have such a beautiful sound, I want to sound like that. What do I do?" His teacher said, "I guess I just support more than you do." Thus, Grabois again interpreted support as squeezing the muscles of the stomach as hard as he possibly could. In contrast, his graduate teacher did not use the word support as much.

[70] All information in this section taken from personal interview, Daniel Grabois, interviewed by Tsai-Ying Li, February 24, 2017.

When Grabois began to teach, he discovered that he was no longer squeezing the muscles of the stomach when he played the horn. He had changed his technique unconsciously. He started experimenting with different ways of playing and realized that when he squeezed his stomach muscles, his throat became very tight, making the sound worse. Thus, he started to experiment with various other approaches. According to his teachers, he needed to support the music, but he found it was far better when he did not squeeze his stomach muscles.

He remembered taking a lesson from his 12th grade high school teacher. He was confused at that time about support because when he squeezed his stomach, he became very tense. His teacher said that support is exactly the opposite; it is the relaxation of the abdominal muscles. However, this confused Grabois because one person was using support to mean tightening your muscles as much as possible, and another was using it to mean relaxing your muscles as much as possible. Grabois has never used the word support in his teaching because he found that every player has a different meaning for the word, resulting in confusion for everyone. Instead, he has done considerable experimentation to determine an approach in his teaching that will help all his students.

When he came to the University of Wisconsin-Madison, giving master classes with his faculty colleagues, he noted that Professor Mark Hetzler (trombone) often

used the word “air support” in his teaching. Hetzler indicated that air support means using enough air at the point of the lips and the embouchure to keep the sound going. Grabois realized that this has nothing to do with squeezing the abdominal muscles. When he talked to Professor John Stevens (tuba), Stevens said that he never heard about squeezing muscles. The tuba world no longer talks about diaphragm squeezing because of Arnold Jacobs.

At this point in the interview, Grabois summarized: “support” means either squeezing the abdominal muscles or relaxing them. It means using air to make the lips vibrate. And many teachers use the word “support” to define “a supported sound”: a “supported sound” is “well-supported” by the musculature.

Grabois has demonstrated that there is a system for playing the horn where the lips and the air work in tandem. The lips tense or relax for the position of the notes and that is what determines the way the air feels. Lips and air work together as a system, so students need to monitor what their lips are doing and what the air is doing. He also points out that the low brass instruments are bigger and require much bigger air flow than the horn because the opening of the horn is narrow. If students use the kind of air flow on the horn that tuba players use, they will have trouble on the horn because a heavy air flow creates considerable turbulence in the cup of the mouthpiece and blows the lips apart, making it is even harder to feel the embouchure for note

placement. Therefore, Grabois has avoided constant requests to use more air, focusing more on efficiency. Many of his older students come in with ideas about faster air, cold air, warm air, and so on. He has found these terms confusing, even though they might mean something to some people.

Grabois believes many problems come from teaching. For example, when taking a lesson with a very naturally strong, good player, one student might ask the teacher "How do you play high notes?" The teacher could say "I don't know, but let me play and see what I do." Playing a few high notes, the teacher notes that his abdominal muscles were more engaged. So the teacher says "The stomach muscles are more engaged when I play high notes." That observation can be interpreted as "horn players must engage the stomach muscles to play high notes." But the reason the stomach muscles have engaged is not that the teacher consciously engaged them. Rather, a correct embouchure, with a small firm aperture for high notes, creates more resistance, and the player blowing the air past that resistance will experience a tightening of the abdominal muscles. This is different from the player trying to tighten the abdominals – it happens automatically because of the resistance encountered. In this way, a beautiful system in which lips and air work naturally and effortlessly in tandem is transformed into a directive: "squeeze your stomach muscles."

This is the beginning of problems for students. It is true that when students play

louder or play higher, the stomach muscles are more engaged. When they play low notes, they are still engaged to a certain degree (less, because of the lower resistance in the lips). However, it is also true that when a person walks, the leg muscles engage in a certain pattern that makes them walk, but that does not mean that in order to walk, a person should consciously engage those muscles. Grabois views support in the same way and therefore avoids using the word "support" in his teaching.

Instead of using "support," Grabois has used a metaphor of singing to illustrate the concept of air. He believes talking about "singing the air" is a better representation of what it feels like to play. He also believes that the hardest thing to teach is "how to move the air from the body into the horn," because students can see neither air nor aperture. Talking about singing takes the students straight from the musical concept into the technique. Grabois believes that the responsibility of the teacher is to help every student play as naturally as possible rather than to impose a technical system onto each player.

Students must develop consistent muscle memory in their lips to control pitch. The feeling of the lips for any given note results from the combination of lip engagement and air flow. If students do not know exactly what each note feels like, they are always uncertain, and this uncertainty greatly hinders horn players. At the end of every inhale, the lips must be set with confidence for the first pitch of the next

entrance, at the appropriate dynamic level.

Grabois believes that using the concept of “singing the air” can be a metaphor for breath control as well. The concept of singing the air moves the technique of air control into the musical realm. Ultimately, the goal is for the musical line to generate the technique, and not the other way around.

Common interview themes

The interviewed musicians mostly agreed that air stream is the key element for playing the horn. Frank Lloyd and John Fairfield agreed that with more air pressure, the volume of air increases. As the volume of air increases, the speed of air increases. As the speed of air increases, the vibration of air increases. As the vibration of air increases, horn players reach higher pitches. Therefore, higher pitches require more air pressure. In contrast, lower pitches require less pressure than high pitches.

Frank Lloyd	Versus	John Fairfield
More air pressure (faster air) = louder Less air pressure (slower air) = softer		Faster vibrations = higher pitches slower vibrations = lower pitches

Another common theme in the interviews was that Clevenger, Grabois, Wakefield, and Fairfield all agreed that thinking about pushing hard or putting

pressure on the diaphragm or the muscles of the stomach is a less effective way to play the horn, since this causes tension in the throat (and elsewhere). In addition, Clevenger, Wakefield, and Grabois all argued that using imagination is an effective way to help students develop their musical ideas and produce full resonance. Grabois, Clevenger, and Fairfield all indicated that focusing on the music itself is a better strategy than thinking about the mechanics of breathing. Grabois uses the term "sing the air" to help students focus more on producing their musical phrases. Wakefield uses the imagery of "an egg shaped swirl" for students to keep the air flow undisturbed. Clevenger uses the term "sustain" to help students maintain a steady air flow and focus on the artistic and mental aspects of performance. Fairfield believes that to have a deep breath and play musically is the best approach for horn players. Lloyd believes that horn players can produce the full resonance and color of the sound by keeping the airflow undisturbed and clean. All the interview subjects look beyond the technique of air control to focus on the beauty of sound and line – in this way, they unite the physiology of playing with the emotion of music.

Chapter 7. New Definition of Support in Brass Pedagogy

What is support? As the present document has shown, it depends on who is doing the defining. Yet every pedagogue's goal is the same: to help students create beauty and artistic excellence.

Three different facets of the concept of support have emerged here. This first, and most purely technical, is the engagement of specific muscles which work in tandem to produce excellent horn playing. It has become clear that the mutual activity of air and lips is the key: as the lips engage more firmly to play higher, the resistance increases. The player therefore needs, in order to maintain air flow, to blow harder. In so doing, the abdominal muscles will engage in a deeper fashion. In order for the process to happen quickly and smoothly, the player needs confidence. The lips must move without hesitation to shape each note, and the air flow changes in perfect synchronization with the lips movements.

"Support" therefore refers to the entire system of air-and-embouchure cooperation. This system is in constant flux. Playing louder and higher will lead to greater muscular engagement (giving rise to the traditional "squeeze the stomach" approach), while playing lower and softer will have the opposite effect ("relax and breathe"). The coordinating factor in the system is time: changes must be

instantaneous and must be coordinated. And the ability to control time with such precision comes from confidence – the mental side of support.

The pedagogical lesson is that horn playing can be best understood as a system in which each part relies fully on the others. Focusing only on the embouchure can lead to a neglected air flow, resulting in a weak, shaky sound, diminishing confidence along the way. Focusing only on the air flow can lead to an unresponsive embouchure, leading to missed notes and poor register changes, with the same resulting diminution of confidence. Only by focusing on how the system works in its entirety can the teacher help each student achieve excellence. And the entire purpose of this system must always be kept alive and active: to produce beautiful phrases, with a deep and rich sound, and with all the nuance that makes music so meaningful to players and listeners.

Along the way, the concepts revealed in the interviews will find their place: fast air, less air pressure, sustain, sing the air, egg-shaped swirl, even abdominal muscle engagement – all of these will convey a part of the picture, and a meaningful part when the system is fully understood. When the embouchure, breath control, diaphragm, abdominal muscles, and state of mind all work together to deliver the beauty of the music, this is support.