Intonation Exercises for Wind Players

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We wind players are faced with a task quite different from that faced by string players when it comes to intonation. On one hand, players of wind instruments have an advantage in that each note position is determined with the help of keys, valves or slides while string players are left out in the open air needing to find each note on an unmarked finger board. On the other hand, when it comes to fine tuning, a string player can simply move a finger one way or the other to adjust, while wind players have to employ techniques involving the embouchure, breath control and sometimes finger shading or slide movement. In both cases, the ear must be adequately trained, but the wind player faces additional difficulties such as changes in tone color as the pitch is slightly altered and the tendencies of different notes throughout the range of our instruments. If only it were true that "my instrument was tuned at the factory"! The realities of ideal tuning and temperament, however, make this something of a pipedream. Tuning well is a continuous process requiring great effort. I remember one instance of playing chamber music with a large group of strings and winds. Through careful rehearsing we reached a point where we all felt very satisfied and comfortable with our intonation. A cellist in the group gave the winds the ultimate compliment: "You guys tune like string players!"

Hereafter are some exercises I've developed specifically to help wind players with intonation. First is a bit of the story behind how I came up with the exercises. You may want to jump directly to the exercises themselves, but the sections "Preparation for the Exercises" and "General Instructions" contain important details as well. Some of my ideas and opinions may be debatable, but I've found that the exercises outlined below are truly effective.

"OUT OF TUNE!"

"Bassoon you're out of tune! Sharp!, sharp!, sharp!!" These words from a conductor constituted one of the first major criticisms of my playing as I began my serious musical education en route to becoming a professional. And I didn't take it very lightly. I'm not from a musical family, have no perfect pitch to speak of and can't sing to save my life, so I was pretty sensitive about the issue and was hard-pressed to figure out how to overcome this major drawback in my playing.

I remember those harsh words from when I was a student at a high school summer music camp in 1980. This was about the time that Korg came out with the portable Chromatic tuner. An oboist at the camp had one and let me borrow it to see if I could begin to solve my intonation problem. It was a dilemma I eventually learned was not exclusively my own. I know now that even people with perfect pitch can have problems tuning, but at the time I took it very personally.

Most instrumentalists checking their pitch on a tuner probably do as I did that first time that I had this magical meter before me: play a note and "bend" it to get the needier to straighten up to zero. A little more initiative and one might decide to play long tones while looking at the machine, keeping the note in tune as well as possible. I soon realized, however, that tuning up as well as learning to hear and adjust requires more than just responding directly to the meter while playing long tones. So I gradually developed a series of exercises where I would close my eyes, play a note, and then open my eyes to see if I was playing it in tune "on my own". Now some notes on the bassoon tend to be very sharp (and a couple flat) depending somewhat on the reed, instrument, player, etc. My Bb2, for example, was the very note that the aforementioned conductor lost his temper over, motivating me to devise this exercise using the tuner: with my eyes closed, I'd play Bb and listen to it carefully before opening my eyes to check the tuner. I'd do this several times until I could hit the "bull's eye" a couple of times in row. Then I would purposely try to play the note a little high (closing the eyes first!) before playing the note in tune again. This helped me to hear this minor difference. Then, to train my ear further and develop flexibility, I would play the note a little flat (always closing the eyes first), then in tune yet again. For some notes, it can be difficult to hear a small difference in intonation. Perhaps this is due to very little change in the tone color

of the note when the intonation is "bent" this way. Nonetheless, I did the best I could and soon found that this exercise was ideal. I actually began to hear when I was even slightly out of tune, hence my intonation in chamber music and orchestra displayed a noticeable improvement!
I'll never forget the final concert of that summer music school when we played Tchaikovsky's 1812 Overture. After I played the bassoon solo that ends on that Bb, the conductor gave me a rare, approving smile that I'll never forget.

IDEAL TUNING

While in music school (at Carnegie-Mellon University) I had the good fortune to take a class entitled "Physics of Musical Sound" taught by a very enthusiastic man named Hugh Young -a renowned professor of Physics and excellent amateur organist. The class dealt with the production of musical pitches, their harmonic series, temperament, etc. Here I learned that the tuner I had been using was calibrated to the equally tempered scale. In the tuner's language, this means that there are exactly 100 cents between each half step. The class explored in detail such themes as "ideal" or pure tuning where a major third, for example, to sound in tune (or beat less), must be played 14 cents narrower than the equally tempered version. Normally this is best achieved by playing the root in tune (by the tuner's standards) and the third 14 cents low. It is the goal in most instances of group playing to tune purely or ideally- we usually try to do away with unsoundly "beats". Therefore, to deal solely with the example of major thirds, we ought to have sufficient flexibility to play every note on our instruments 14 cents flat. Of course there are many other intervals, as well as exceptions to this rule, opening up a topic worthy of an article at least as long as this one. This is just one example to show that playing in tune is often a very complicated matter. In real life situations (i.e. in orchestra and chamber music), the combination of the necessities of harmonic structure with the flaws and tendencies in the intonation of all involved can make intonation quite a sticky matter. In my 15 years as a professional, my philosophy has always been to avoid blaming others (it may be the harmonic voicing to blame!) and to be prepared to hear and adjust in any situation. Of course most problems are best solved by working together as a group, but the fact is that if all the individuals in any group can hear and adjust to ç minute changes in pitch, good intonation should be that much easier to achieve. Also, it has been my observation that playing very well in tune consistently is very difficult if not impossible for players even of the highest level. No sooner does one find oneself in a wonderful groove, then does the weather change or a colleague fall sick forcing a personnel change or for no obvious reason, the pitch begins to deteriorate. In these cases, I find myself sitting at home or someplace quiet with my tuner calmly going through the exercises outlined here.

SELECTION OF TUNER

A chromatic tuner, of course is necessary for doing these exercises. Its purchase should be made carefully. If possible, take the time to try out several models with your instrument. This might be done by borrowing from a friend, or by bringing your instrument to a music store to try different tuners there. It should be easy to see intonation differences of as little as 5 cents on the tuner's meter. I prefer a needle indicator rather than those with blinking lights. Also, the tuner should respond well to all the notes in the whole range of the instrument at all dynamic levels. Most tuners these days automatically detect the note being played. The older models had a dial to select manually any note in the chromatic scale. There are models available now with both auto and manual options. On automatic tuners not having the manual option, a different note may register than the one you play, especially when you play it a little out of tune as is called for in the exercises. A tuner with both auto and manual options is probably preferred so that all the exercises can be done with peace of mind. For many years, I used the manual, now antiquated (but still functioning!) Korg WT-12 in combination with the Boss TU-12H which is automatic (I used the latter for the "note approach" exercise). The meter on the TU- l2H, however, always uses A=440 as a reference; that is, if the calibration is changed from this standard, the needle won't point to zero when the note is in

tune. Only the "tuning guide" arrows reflect the change. Therefore it's difficult to quickly recognize the amount that any note is out of tune. Lately, I have depended on the newer Korg CA-20 which is small; responds well and is easy to read. It cannot produce an audible tone, but this is not necessary for these exercises. The even newer Korg CA-30 is similar plus has a speaker to sound a tone if desired.

PREPARATION FOR THE EXERCISES

These exercises are very simple. If they are done calmly and correctly, good results will come without having to spend too much time on them, but doing them right is paramount to their effectiveness. Some points may be varied according to personal taste. The details I find of utmost importance are stated bluntly, often with emphasis.
One should find a quiet place free from hums or buzzes like those produced by fluorescent lights or computers. Indeed, a computer turned on nearby creates a magnetic field which may hinder the performance of the tuner. The temperature of the room should be a comfortable one (in very hot or cold rehearsal situations, everyone's pitch is affected). Lighting should be such that the tuner's needle doesn't cast a confusing shadow on the meter. It is advisable to warm up before attempting the exercises. They probably work best as a "warm-down"; that is, at the end of the practice session. (Sometimes for me, when time is scarce, the exercises make up my whole practice session.) The tuner should be placed at an adequate height perpendicular to one's gaze to insure correct, easy visibility of the meter. The device should be calibrated to the tuning note used in one's particular 'musical environment. Finally, the player should be calm, and ready to attack note by note the process of tuning. With some notes it may seem impossible to do the exercises at all dynamic levels. In that case, one should just stay within one's capabilities with regard to dynamic range. It all may be a little intimidating or frustrating at first, but with patience and attention to each small step, improvement, I feel, is inevitable.

GENERAL INSTRUCTIONS

In all the exercises, it is very important either to close your eyes gently or to look away from the tuner before playing any note. If you're more comfortable simply glancing away from and back at the tuner rather than closing your eyes, the instructions should be interpreted accordingly.
At first, it is not necessary to stick to any set rhythm in executing the steps of each exercise. Time should be taken freely and as necessary to gain facility in achieving each small intonation and/or dynamic target. Later, one should try to apply a rhythmic pattern similar to what I've put in parentheses using a metronome marking of 50-60 beats per minute. It is advisable, however, to leave the metronome off while doing the exercises as it can be more of a distraction than an aid. Breaths can be taken as needed to remain comfortable.
If at any point during any of these exercises the player begins to get tense and/or frustrated, no improvement will be made. If this happens, try changing notes, or simply taking a break. It is recommended to spend no more than 15-20 minutes per practice session on these as a whole. The concentration level should be high and fatigue may set in quickly. Dedicating a small but efficient amount of daily practice to just a few steps of one exercise is probably enough to ensure improvement. With time, they should prove less and less difficult.
Remember, these exercises were developed to be practical. The decision of which note to tune with which exercise ought to be based on intonation problems that one has either in general, or in a current piece one is involved in.

THE EXERCISES

1. Pitch Placement

This first exercise is a simple, effective training tool for developing good solid intonation and for learning to hear and play small deviations in pitch. At first, it is best to maintain the same fingering and/or slide position during the exercise. The intonation should be altered only with the embouchure or the way one blows the note (varying the throat aperture, etc.). If a note has alternate fingerings, they may be

utilized as well, but use only one fingering per repetition of all the steps. Above all, be as attentive as possible at all times to the intonation! Step 10 describes the whole exercise in brief once the general directions are understood. For more detailed comments on these and other points (marked *), see the section Notes on Pitch Placement below.

1. With eyes closed play the note to be tuned at a comfortable dynamic level, i.e. mf. (2 beats)
2. Sustain the note while opening the eyes to check the tuner. (l beat)
3. Rest for a moment while closing the eyes for the next attack. (l beat)
   a. If the note was not in tune, repeat steps 1-3 listening carefully while making the necessary adjustment. It is important to avoid bending the note while looking at the meter*.
   b. When the note can be played in tune twice in a row in this fashion, proceed to step 4.
4. With eyes closed, play the note at the same dynamic level, this time trying to play it exactly ten cents sharp or, if preferred, ten cents flat (later we'll go in the opposite direction). (2 beats)
5. Sustaining the note, look to see if the intent was successful. (l beat)
6. Rest for a moment while closing the eyes for the next attack. (l beat) ** If it proves extremely difficult to hear and play a steady tone 10 cents "out of tune" in this fashion, first try the exercise using a differential of 15 or 20 cents in steps 4-6 and 7-9*.
   a. As before, repeat steps 4-6 until the note has been played ten cents out of tune as intended.
   b. After successfully hitting this target level <u>once</u> go back and repeat steps 1-3 until the note is played in tune twice in a row as before.
7. With eyes closed, play the note, still at the same dynamic level; this time trying to play it 10 cents out of tune in the opposite direction from steps 4-6.(2 beats)
8. Open the eyes (while sustaining the note) to see if the intent was successful. (l beat)
9. Rest for a moment while closing the eyes for the next attack. (l beat)
   a. Again, repeat these last three steps until the target intonation has been bit one time.
   b. Go back and repeat steps 1-3 once more until the note is played in tune twice in a row.
10. Repeat the whole process (steps 1-9b) at the same dynamic level, this time playing the note in tune only once each time steps 1-3 are repeated. When any target level is missed, it should be repeated until done correctly, but one should work towards playing the note in the fashion indicated five times in succession: in tune, ten cents sharp (or flat), in tune, ten cents flat (or sharp), in tune; all in one breathe.

From here, there are several possibilities of what to do next. One may either tune the same note again at a new dynamic level, of do the exercise with the same note in another octave at a comfortable dynamic level. Then again, one might choose to go on to a completely different note. The ultimate goal should be to master steps 1-9b and then step 10 for all notes on the instrument at 3 dynamic levels: p, mf, f.
Each individual may further adapt the above exercise in many ways regarding note order, application of dynamics, etc. Below are a couple of highly recommended variations:

- Follow steps 1-3 by playing the note at the comfortable dynamic once per octave. At first, play each adjacent octave rather than jumping two of more octaves when changing notes. When one octave is out of tune, go back to the previous octave and start from there. This step is for tuning and hearing this interval!

- Apply different dynamic levels to the above, mixing up p's and f's, etc. with each attack.

- Try doing the pitch placement exercise in staccato. The CA-20 tuner, for example, responds quickly and retains the intonation level for a few seconds after the note has concluded. It is possible to close one's eyes, play a short note and then open the eyes to see where the note tuned.

If more than one note is to be tuned in a session, it is recommended to avoid two

successive notes which form a major third. It is better to move by fourths, whole steps of half steps. (*)
For me, the Pitch Placement exercise is the most effective and therefore most important of the four exercises outlined here. The others are more of less variation of the ideas presented above.

2. Attacks in Crescendo/Diminuendo

Here is an exercise for attacking the note in tune in all dynamics. Here, each attack should be played without accent.

1. Do steps 1-3 of Exercise I for the note to be tuned, playing the note pp.
    a. Repeat these steps with the same note at p, then mf, f, ff, f, mf, p and pp. More subdivisions of the dynamic range may be applied as well.
2. Any time the note is played out of tune, go back to the previous dynamic level.
3. Repeat the process by going from ff to f, mf, p, pp, p, mf, f and ff.

When a note proves very difficult to tune at a certain dynamic, the Pitch Placement exercise may prove helpful at the trouble point.

3. Long Tones

For this exercise, it is important to utilize a set tempo (i.e., 50-60 beats/minute). As stated before, it is better to mark time mentally rather than with a metronome.

1. Prepare to play a long tone by taking a deep breath. With eyes closed, attack the note to be tuned at a comfortable dynamic. (2-3 beats)
2. Maintaining the note at the same dynamic, open the eyes to check the tuner. (I beat)
    a. If the note is out of tune, stop, rest a moment and begin again at step 1. When the note is established in tune, proceed to step 3.
3. Maintaining the note at the same dynamic, close the eyes again (2-3 beats).
4. Open the eyes to check the tuner (1 beat).
5. Continue playing the note with the eyes closed, opening the eyes to check the tuner every 2-3 beats until you run out of air.

If the intonation ever wavers by more than 5 cents from zero, stop, rest a moment, and start again.
Perform the long tone as indicated sustaining the note at other dynamics. Keep the same dynamic for the entire duration of the note.
After mastering this exercise at steady dynamic levels, repeat it at pp for steps 1 and 2. Then do a slow crescendo arriving at ff at the end of the breath, opening and closing the eyes as before, every 2-3 beats. This time, if the intonation ever wavers by more than 5 cents, stop, rest a moment and start again at the dynamic of the last time the eyes were opened (when the intonation was good). The goal is to keep the note stable (within 5 cents) throughout the entire long tone. Remember to be patient if this proves difficult at first!
A decrescendo should be applied, from ff to pp. Finally, apply a crescendo-diminuendo (pp to ff to pp) paced over the duration of the breath, and vice versa (ff to pp to ff). Remember to maintain the initial dynamic before opening the eyes for the first time. Proceed with the crescendo or diminuendo only after the note has been established in tune at the starting point.

4. Note approach

Here is a variation of exercise 1 where the note to be tuned is slurred to from another note. It is especially designed to work on problems encountered in rehearsal and performance situations. The following deals with two notes, although more variations may be invented utilizing more notes in succession. It is recommended to tune the target (second) note with exercise 1 before trying this variation.

1. With eyes closed, play the first of the two notes (2-3 beats).
2. Open the eyes to check the tuner (1 beat).
    a. If the note is not in tune, repeat steps 1 and 2.
3. When the note is in tune at step 2, close the eyes and slur to the second note (2-3 beats).
    a. Open the eyes to check this note (1 beat). Repeat steps 1-3 until the second note is in tune.
4. Repeat the exercise but this time, as in exercise 1, try to play the second note 10 cents sharp (or flat).

5. When the target intonation level is met, repeat steps 1-3(playing the target note in tune).
6. Perform the slur again, this time trying to play the target note 10 cents in the opposite direction as in step 4.
7. Repeat 1-3 (target note in tune).

NOTES ON EXERCISES 1-4

These exercises should be performed without vibrato and with the best tone possible. Indeed, few exercises call for the production of an undesirable sound quality. However, playing some notes slightly out of tune will often result in a drastic change in tone color. In fact, some notes will seem to sound "better" when played as much as 15 or 20 cents sharper or flatter than the equally tempered norm. In this event, the exercises should be done with the thought in mind of improving the tone quality of the note when it is played in tune. Eventually, the ear will accept the tone color of the "in tune" version of the note as the optimal one. A tuner such as is the case with the CA-20 mentioned earlier may "hear" and tune only the fundamental of the note being played. It is possible for a note to be "out of tune with itself' if the overtones produced in the sound are not properly lined up. This is something that happens if I play on a reed that's reaching the end of its usable life, even though it tunes on the tuner with the exercises. Be wary that your tone is full and well-rounded or the exercises will help tune the fundamental only but not the whole spectrum of sound being produced.
At some dynamics, it may seem impossible to play certain notes in tune. Personally, with a brand new bassoon reed, I am of ten unable to play some low notes (G, G#, A) fortissimo without going very flat. In this case, I simply play the note only as strong as I can while accurately following the steps of the exercises. As the reed gets broken in, it becomes easier to tune these notes at ff. The fact that these exercises are effective in overcoming such intonation problems may be proof that they not only help train the ear and embouchure, but help "tune" reeds, mouthpieces and instruments as a whole. (I admit to having opened a debatable issue...)

*Notes on Pitch Placement
(Also applicable to Note Approach)

I choose ten cents as the amount by which to deviate the pitch for several reasons. Deviating by as much as fifteen cents takes one a little too far from the equally tempered scale, which should always be a strong reference point. Though I mentioned earlier that the major third theoretically needs to be adjusted by 14 cents, in my experience, using ten cents as the variation in this exercise is enough to develop control for such situations. (This is also why it is not advisable to tune two successive notes that are a major third apart.) On the other hand, differences in pitch of as little as five cents are very difficult for most people to hear. Perhaps after perfecting the exercise at 10 cents one may try to "fine tune" further some notes using 5 cents. Also, on most tuners it is easy to see a 10 cent deviation and through my experiences, it has proved to work best with most players. If, as suggested earlier, the player first opts for a differential of 15 or 20 cents, the differential chosen should be stuck to during that repetition of the steps. It may also be necessary (realistic?) at first to allow a margin of error of 5 cents in all the steps of the exercise. The goal thereafter should be to reduce the differential to the recommended 10 cents and the margin of error to 1 or 2 cents.
The indication to avoid "bending" the note while looking at the meter is so that the ear clearly hears different pitch levels of each note. In ensemble situations, bending occurs all the time, but one should be listening as one does so. (I am against consulting with a tuner while playing with others - see *Playing with Others*). In the exercises, slight bending is inevitable, but should be done as quickly as possible during the intervals when the eyes are closed. We want to train our ears, not our eyes!
Repeating the note in tune various times is obviously intended to establish the note firmly for the ear and the embouchure position. As stated, the best way to vary the pitch for this exercise is by changing the way one is blowing the note, either with the lips, mouth position, throat or some combination of these. Finger shading (for woodwind players), or slide moving (for brass players) may be used to fine tune these specific techniques, but

this exercise is ideal for pitch awareness and flexibility without these "tricks".
The beat dedicated to resting a moment may be lengthened to 2 beats or more or may be eliminated if desired. Also, one may invent different combinations of exercises using the ones above. For example, do *Pitch Placement* for a note and follow it up immediately with a tuned long tone on the same note.

PLAYING WITH OTHERS

These exercises will help the intonation of players of all levels. After working with them for only a few days, one's ability to hear and adjust will improve dramatically. When a chord or simple unison is out of tune, it's easy to hear there is a problem, but now an instinct will develop to hear instantly in which direction to adjust. These exercises are not a cure-all, however, and more work will be necessary on leaving the practice room. To better one's intonation further, it is recommended (not just by me!) to pair up with a colleague to play scales, duets, orchestral excerpts, etc., remembering to focus on intonation. Playing sustained notes alone with a piano is helpful, but has its limits. I can say that I was very lucky to have studied bassoon with Arthur Kubey (at Carnegie-Mellon) who spent many hours playing orchestral excerpts with me. This not only helped with my intonation, but helped my sound immensely. Plus, I had several non-bassoonist buddies with whom I dedicated many more hours of practice. This proved to be a great way to learn.
When one is playing with others, especially in larger groups, there are some rules of decorum which help smoothen the ever sticky intonation process. Although one may be certain that a colleague is very sharp or flat, the problem is always best confronted diplomatically. It's better to say "I think I may be a little flat on that G. Can we play it together?" than to blurt out "Man, your Gis really sharp!!" It is obviously very courteous to adjust to the needs of our fellow musicians, and mutual communication is integral to achieving good results. For example, sometimes it is necessary to decide who will hold firm and who will adjust to avoid a pitch bending free-for-all!
One result of doing the exercises will be that previous chronic tendencies of some notes will no longer come into play. That is, a note which before always proved to be flat will now be more in tune when played normally. If that note suddenly sounds out of tune in a chord, one should resist the automatic urge to "lip it up". Instead, the best remedy is to relax and rely on one's newly trained ear. Again, dialogue with our colleagues is a must.
Many orchestral musicians like to have a tuner turned on on their stand during entire rehearsals and even during concerts. This is something which I do not condone. As mentioned earlier, it's better to use one's ears than one's eyes. Having a tuner as an occasional reference is one thing, but its constant presence will undoubtedly distract from other important elements of music making like phrasing, articulation, note-shaping, etc. Also there has to be a certain amount of give and take in all ensemble situations. I feel that the tuner is best exploited as a tool to check and train our hearing. This is the whole point of these exercises.

CONCLUSION

I recognize that the idea of playing a note with one's eyes closed before looking at the tuner has been used by other teachers and players. AII I've done is taken it a few steps further. Many other exercises have been developed using a tuner; some of which I'm not so crazy about. Having a tuner generate a tone while one plays scales over that tone is an interesting practice, but that synthetic sound doesn't come into play too often in real musical situations. (On the other hand, this would be a great exercise to do with a practice buddy rather than the tuner.) I've heard of an exercise where the player plays unison with a tuner's tone. Then the player slowly lips the note down, listening to the beats increase as the note gets more and more out of tune. This again is interesting, but in my opinion not very practical as the exercise may call for varying the pitch by a quarter tone or more. This brings to mind some contemporary music which calls for the production of microtones such as quarter tones. It shouldn't be too hard to adjust the above exercises while searching for the adequate fingerings to tune appropriately in such situations.
There, I've said a mouthful in describing a couple of exercises that are simple to learn, but a bit more difficult to perfect. I

have found them indispensable for myself and many students throughout my career. My only intention has been to share what has worked for me and hope that others may be able to benefit from my experience. Time to tune up!

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