

The Effects of Clip-On Instrument Tuners on Intonation

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Introduction

The ability to play in tune is a critical skill in the development of every musician, regardless of instrument, style, or age. Virtuoso technique, musical phrasing, and flawless execution of notes and rhythms cannot trump an otherwise out-of-tune performance. A simple piece, played perfectly in tune, will be well received by adjudicators and audience members.

Previous researchers have found many factors influencing the performance and perception of intonation, including the type and frequency of the instrument providing a reference pitch stimulus (Byo, Schlegel, & Clark, 2011; Cassidy, 1989); the tone-quality of the instrument (Worthy, 2000), and melodic context and experience (Morrison, 2000).

Although these studies all provide a foundation for objective measurements of intonation, no studies to date have examined the effect of using individual tuning devices on students' ability to play in tune. Clip-on instrument tuners have the potential to teach students what it feels like and sounds like to play in tune with other musicians.

While the tuners are not a substitute for good teaching or appropriate intonation exercises, they could be useful as a tool for helping students understand pitch tendencies and measure intonation in a meaningful way.

The purpose of this study was to determine the effect of clip-on instrument tuners on computer-generated scores of intonation among high school band students.

Methods

High school band students (N = 55) were randomly divided into experimental (n = 28) and control (n = 27) groups. Both groups completed a pre-test to establish a baseline measure of intonation. Students tuned individually to a concert Bb using a Korg CA-1 chromatic tuner and then performed the melody to *Chester* from the *Foundations for Superior Performance, Warm Ups & Technique for Band* by Richard Williams and Jeff King (1997).

Subjects performed the excerpt with a metronome set to 72 bpm. Intonation scores were calculated with the performance analyzer feature of the AP Tuner app on an iPhone 5s. The performance analyzer measured the intonation of each note over time and calculated a single score that represented the average number of cents sharp or flat for each subject. The analyzer also recorded the average distance from the sharpest to flattest pitch the student played over time.

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These two measures are labeled as “Average Distance from 0 Cents sharp/flat” and “Average distance between sharpest and flattest notes.”

Subjects in the experimental group then received a Snark® SN-8 model clip-on instrument tuner and were instructed to attach the tuner to their instrument every day in rehearsal for 15 weeks. Students in the experimental group received no additional treatment and participated in the same activities and lessons as the control group. At 15 weeks, both groups performed *Chester* with a metronome, and scores were recorded using the AP Tuner app once more.

After the experiment was complete, instrument tuners were distributed to students in the control group for fairness and equity and to evaluate the effectiveness of using clip-on tuners as a complete ensemble.

At the end of the year, after all students had an opportunity to work with the clip-on tuners, a live online survey was administered through <http://polleverywhere.com>. In an effort to get a more complete picture of the effectiveness of clip-on tuners, we surveyed students about their experiences using these tools in rehearsal in ways the experiment could not measure.

Results

Figure 1 and Table 1 display the means for two unique measures of intonation, labeled as “Average Distance from 0 Cents Sharp/Flat” and “Average Distance Between Sharpest and Flattest Notes.” Each measure provides information about how well the student played in tune, as recorded by the AP Tuner app on the iPhone.

Lower scores indicate better intonation tendencies. A score of 0 for the “Average Distance from 0” measure indicates that the performer played, on average, 0 cents sharp/flat. However, the performer may have also performed very sharp and flat and would still have earned this score. Therefore, the second measure provides information about the distance between the sharpest and flattest notes.

A score of 0 indicates that a performer played, on average, consistently in tune, consistently flat, or consistently sharp. Taken together, these measures provide useful information about the intonation tendencies of a performance.

Figure 1. Differences in intonation scores

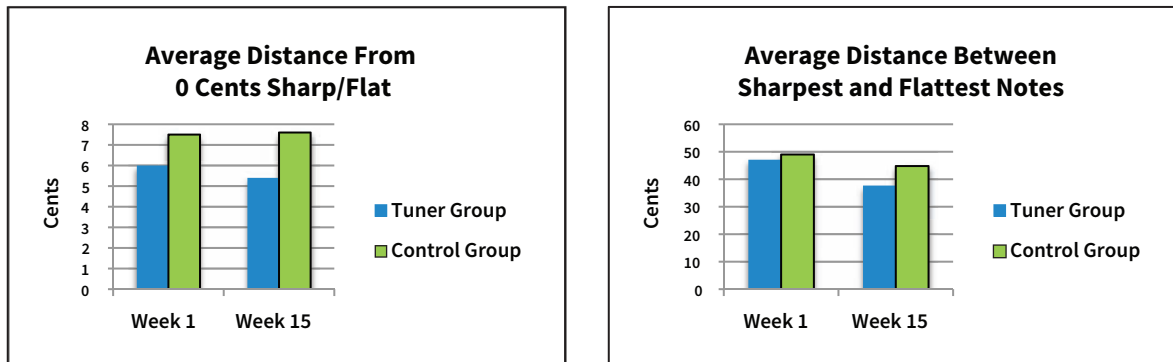


Table 1. Means for week 1 and week 15 intonation scores

	Week 1		Week 15	
	Distance from 0	Distance from # to b	Distance from 0	Distance from # to b
Tuner Group (n = 28)	6	47.1	5.4	37.7
Control (n = 27)	7.5	49	7.6	44.8

Overall growth intonation scores for tuner and control groups were calculated by subtracting week 15 scores from week 1 scores. As Table 2 demonstrates, members of the tuner group narrowly improved their intonation scores by shrinking the “distance from 0” by 0.6 cents, while members of the control group scored slightly less in tune, as they increased the “distance from 0” by 0.1.

However, members of both the tuner group and control group improved the overall range of their pitch tendencies, by shrinking the gap from their sharpest and flattest pitches.

The tuner group had better growth scores on this measure, as they narrowed the gap between their sharpest and flattest notes by just over 9 cents; the control group by just over 4 cents.

Table 2. Growth intonation scores for tuner and control groups

	Growth	
	Distance from 0	Distance from # to b
Tuner Group (n = 23)	0.6	9.3
Control (n = 25)	-0.1	4.2

While members of the tuner group showed better growth intonation scores on both measures, a t-test comparison of means reveals that these differences were not statistically significant. Therefore, we cannot suggest with any statistical certainty that clip-on tuners improved intonation scores for the students in this experiment.

Student Survey

At the completion of the study, students were asked to provide feedback on their experiences with the clip-on tuners through an online survey conducted during a concert band rehearsal. This feedback highlighted some benefits of the clip-on tuners that the experimental data could not provide.

Table 3 displays the results of this survey, showing that students seemed to agree that the clip-on tuners helped improve ensemble intonation (82%) and should be used by all wind students (81%). Some students reported that the tuners were not easy to use on their instrument (34%) and some felt the tuners did little to help them better understand intonation (44%).

Table 3. Student responses to clip-on tuner survey

Question	Agree	Disagree
All wind students should use a clip-on tuner in rehearsal	81%	19%
The tuner was easy to use on my instrument	66%	34%
The tuner improved my ability to play in tune	73%	27%
I understand intonation better this year than I did before	76%	24%
The tuners helped me better understand intonation	56%	44%
The tuners made tuning at the beginning of rehearsal faster	62%	38%
Clip on tuners improved our ensemble intonation	82%	18%

Discussion

Students in the treatment group did show more growth in intonation than the control group; however, the comparative results were not statistically significant and we cannot say with certainty that growth was caused by the tuners. Since both groups showed improvement in intonation over time, it is possible that the improvement could be the result of student growth and natural development of instrument technique.

Students in the control group also noted that they tended to think more about intonation, and perhaps even played better in tune, because the person sitting next to them with a clip-on tuner was playing better in tune. The director noted that it was much easier to tune troublesome pitches in rehearsal and there were several students who could instantly serve as a reference and model an in-tune pitch.

The students also spent considerably less time tuning at the beginning of rehearsal, saving more time for other activities. Students were also able to see in real time how raising or lowering the pitch of certain intervals resulted in better intonation for a given chord. The results of the student survey suggest that the clip-on tuners were useful and had an impact on performance that may not have been reflected in a comparison of intonation scores.

This study has limitations that are important to consider. It was not possible to determine if students paid any attention to the tuner, or even if the tuner was powered on during rehearsal. And while instructions on using the tuner were provided to each student through verbal and written directions, it is possible that some students may not have completely understood how the technology worked. The greatest limitation of the study may have been that the treatment and control groups could not be isolated from each other during the course of the study. Despite its limitations, this study provided a great deal of information to the director about the effectiveness, whether perceived by students or objectively measured by the AP Tuner app, of using clip-on tuners in a wind band rehearsal. During the spring semester, the director required every member of the jazz band to practice and rehearse with the tuning devices and the ensemble received positive scores for intonation on every selection in their NYSSMA® major ensemble evaluation rubric for the first time. The director also gained valuable insight into how action research can inform rehearsal procedures and strategies in a concert band setting.

We hope the results of this study are useful to ensemble directors who are considering the purchase of instrument tuners and need to weigh the effectiveness of the devices against the cost. We also hope this action research serves as a model for any ensemble director who wishes to collect data to inform practice. Finally, we would like to thank the NYSSMA® Research Committee for providing the means and opportunity to conduct this action research project. ||

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