

The Effect of a Conductor on Experienced Musicians Eye-Hand Spans

Research Proposal

Doug Morin

MUSED 496B

Introduction

Numerous studies have looked into the effect a conductor during the rehearsal process or evaluating performances. Researchers sifted through data to investigate the effect of conductor on an observer's impression of a performance, determining what if any impact a conductor has on the perceived expressivity of a piece. The studies investigating sight-reading usually focus on pianists and rarely involve conductors.

The start of the learning process should be as vital at the completion. Numerous clinicians have created acronyms to help students remember basic elements of music to observe before playing the piece. Numerous conducting texts urge directors to "study the score" before stepping in to the first rehearsal. Certainly a conductor enhances coordination as well as makes several musical decisions for the ensemble. Arguably the role performed by a conductor is as vital at the start of the process, when musicians are first see the music and attempt to perform it together. What actually happens when the conductor gives that first downbeat and the ensemble sight reads a piece? Can performers respond to conducting gestures while playing an instrument and sight-reading?

Professional conductors hold a wide variety of opinions on the need to conduct an ensemble while they sight read music. In the introduction to his dissertation, Thompson dismisses the need to worry about high school string players recognizing conducting emblems:

"After many years of teaching public high school orchestra classes, the present researcher found frequent frustration with students not responding quickly to his conducting-gestures, both during rehearsals and at times even during performances. This was especially true when an ensemble was sight-reading (or when the group was still quite unfamiliar with a piece), an understandable issue given that the students are busy dealing with just reading the notated pitches and rhythms for the first time (or

second time), and are not particularly concerned about looking up at the conductor.” (2012, p. 1-2)

This statement is based on the anecdotal evidence of his experience. Conversely, I have heard in numerous conducting lessons to go into the first rehearsal and conduct as if in a concert. All of these opinions are anecdotal, few studies actually monitored an instrumentalist while sight-reading a piece of music, and most of those studies did not include a conductor.

Literature review

The driving question for this study is “Can performers respond to conducting gestures while playing an instrument and sight-reading music?” This question is broad, so it will be explored in many parts. When considering the performer we need to consider their likely knowledge base of conducting emblems, performance level, and what other studies have shown when musicians sight-read. The ability to produce sound on an instrument is a prerequisite of this study, and will be discussed during the methodology section.

Most gestures by a conductor are classified as conducting emblems. Sousa (1988) defined a conducting emblem as a gesture “within the instrumental music world (which gives) specific or precise meaning and common interpretations.” (1988, p.5) He based his definition off of the definition of an emblem proposed by Ekman and Freisen:

Emblems are those nonverbal acts (a) which have a direct verbal translation usually consisting of a word or two, or a phrase, (b) for which this precise meaning is known by most or all members of a group, class, subculture, or culture, (c) which are most often deliberately used with the conscious intent to send a particular message to the other person(s), (d) for which the person(s) who sees the emblem usually not only knows the emblem message but also knows that it was [sic] deliberately sent to him, and (e) for which the sender usually takes responsibility for having made that communication. (1972, p. 357)

Ensemble members develop a knowledge base of a conductor's actions while playing in a structured ensemble. To determine the level of recognition, Sousa asked middle school, high school, and college undergraduate musicians to identify the meaning of videotaped conducting emblems that experts had determined had universal meanings. The conclusion generally showed that the college undergraduates identified more emblems correctly than the younger sub groups. The participants in this study were not playing an instrument while observing the videotape.

Cofer (1994) expanded upon Sousa's research, asking if young musicians could be taught to recognize conducting emblems if given specific training. While this study only looked at short-term retention by seventh-grade students, it confirmed that the treatment group could recognize conducting emblems at a higher accuracy rate than the control group. Cofer expanded on this in 1998 by analyzing students' performances on instruments, demonstrating that students who received instruction in conducting emblems identified the gestures at a significantly higher rate while playing as well as during a "pencil-and-paper test." The students received practice time with the music before participating in the data gathering phase of the study. Thompson (2012) expanded Cofer's model to high school orchestra students and found similar results.

The ability to accurately sight-read music often goes hand in hand with experience. Therefore, observable differences should be found between musicians with difference experience and performance abilities. The amount of information taken in by experienced players is a way to measure these differences. Goolsby (1994) found that musicians with more experience fixate on specific spots in the music for shorter periods of time. The same musicians

also jumped around more, switching from the current musical moment and upcoming ones. Less experienced players fixated for longer periods of time on the notes they played at the same time.

Experienced musicians tend to look farther ahead in the music. Goolsby's study in 1994 showed that the fixation points tended to be farther ahead of the note being played. Before Goolsby undertook his test, Sloboda (1985) tested the eye-hand span of experienced musicians. In his experiment, pianists were asked to sight read a piece of music. At a random point, the music disappeared, but the pianists continued performing. Sloboda determined not only that experienced pianists had larger eye-hand spans, but that they could keep accurately playing longer if the music fit expectations and patterns familiar to the individual. Truitt et. al. confirmed these findings in 1997.

Though experienced players take in more information, they do not necessarily process it any faster than amateurs. Furneaux and Land (1997) noted that professional piano players' "buffer" more information than amateur players, but the time it takes to process is the same regardless of level. The average time between when any musician fixated on a note and when they played it was around one second. The study described this as buffering time. The buffering time was a function of tempo for all levels of players, as faster tempos reduced the time between fixation and performance. Practically speaking this means that professional players' eye-hand spans did not increase while playing music at slower tempos. Another conclusion is that the process cannot take in new information until some of the previous information has been cleared, in this case by the person performing part of the music.

One of the primary reasons for piano use was the simplicity with which MIDI technology could be aligned with the instruments measuring eye fixation and saccades. Wurtz, Mueri, and Wiesendanger (2009) asked if these same results would happen when violinists sight read music. This study used the bow movements to align the eye movement with the production of sound. The authors concluded that the results for violinists comparatively matched previous results with piano players. They determined that experience is mitigated by the structure of the music; musicians reduced anticipation of upcoming music by reading fewer notes ahead when reading a more complex piece of music. No conductor was present in this study and the participants could set their own tempo.

Penttinen, Huovinen, and Ylitalo (2015) considered the effect a set tempo would have on eye-hand span. Most studies before this allowed participants partial to total control over performance tempo, a factor that was measured and reported. In this study, the researchers set a metronome to 60 beats per minute while participants played known melodies. The results matched previous studies that did not incorporate a set tempo. More proficient players fixated for shorter periods of time and all players reducing their eye span at the occurrence of unexpected notes.

Based on this research, we would expect to find that a more experienced musician's quicker fixations would allow time to view a conductor. Though the eye-hand span might be reduced, they would be able to incorporate visual information from a conductor into performance. The level of music, expectations, and tempo would have an effect on this.

According to Sidoti (1990) "A conductor's primary function or purpose is to assist musicians in translating musical symbols from the written page into meaningful sounds."

Beyond that, a conductor appears to serve as a guide for both the player and the audience. Kumar and Morrison (2016) found “listeners appear to be sensitive to the manner in which a conductor’s gesture delineates musical lines, particularly as an indication of overall articulation and style... this effect appears to be mitigated by the congruence of gesture to preconceptions of the importance of melodic over rhythmic material, of certain instrument timbres over others, and of length between onsets of active material.” Numerous other studies suggest that listeners rate a performance to be more or less expressive depending upon the conductor’s gestures. The same could be said regardless of if the ratings were given by a novice or an expert in the field of music. (Silvey and Koerner, 2016) The same study also determined that young players prefer to be “conducted expressively.”

While these results make it clear that a conductor has an impact on those observing, we are more concerned with those giving the performance. Sidoti (1990) had experts rate how successfully high school students played expressive markings while performing known music. The students had three days to prepare music which included expressive markings. The students were recorded responding to a video of a conductor showing either expressive or non-expressive gestures. The recordings to the expressive gestures were deemed significantly more accurate in producing the expressive elements on the music.

An additional question addressed by Sidoti’s study involved the students performing to the same expressive markings on a single pitch with a repeated simple rhythm. Accuracy ratings for every category increased. The author stopped short of drawing any solid conclusions, but this seems to correlate with other studies that speak to music level versus experience.

Research Questions

The broad, non-specific question: Can performers respond to conducting gestures while performing on an instrument they have experience playing and sight-reading music?

Specific research questions:

1. Where does an experienced musician's gaze fixate while playing an instrument and sight reading with a conductor who shows no expressive elements?
2. Where does an experienced musician's gaze fixate while playing an instrument and sight reading with no conductor present?
3. Where does an experienced musician's gaze fixate while playing an instrument and sight reading with a conductor who shows expressive elements?
4. What differences in fixation points and saccade patterns occur between questions 1 and 2, 1 and 3, and 2 and 3?
5. Does performance accuracy change in the presence of a conductor?

Methodology

Participation in the study will be limited to undergraduate instrumentalists. Participants will provide their own brass, woodwind, or string instrument for the test. Admissible participants must meet at least one of the following criteria:

- The student has been accepted into a School of Music as a Music Major or Minor on that instrument.
- The student is a Music Education Major with a specialization in that instrument.
- The student was accepted into an auditioned band or orchestra affiliated with the School of Music regardless of college major.

The participants will fill out a short demographic survey and a pencil – and – paper test to determine the basic knowledge level about conducting emblems. Warm-up time will be given if requested. After calibrating the equipment, the participant will view a short sample video of the conductor to acclimate to the conductor's beat pattern and complete a sample exercise while viewing the sample conducting. Explanations will be given as to how each piece will start and stop, as well as conducting emblems that may or may not be present in the videos

of the conductor. The participant will then play three different musical samples. In sample A, the participant will sight-read music with no video of a conductor projected. In sample B, the participant will sight-read music with a video of a conductor who shows no expressive conducting emblems projected. In sample C, the participant will sight-read music with a video of a conductor who shows expressive conducting emblems projected. The order of presentation for the conducting videos and musical samples will be randomized. A short pencil-and-paper form will be completed by the participant after completing the musical examples. This survey will gather data about what the participant thought they focused on during the trials. It will also attempt to account for any use of peripheral vision not accounted for by the technology. The anticipated time for each person is expected to be 25 to 35 minutes.

The three musical examples will be short, novel pieces. The notation will be published using Finale® software. Rhythms should be known to the participant beforehand and may include quarter, eighth, and sixteenth notes. Pitches should stay within a key signature common to band and orchestra music and will not exceed a comfortable range for any instrument. The examples should contain recognizable patterns, including scales, arpeggios, and small leaps. The music will be displayed at a size comparable to music typically read in an ensemble setting. No expressive notation will be included with the music, only key signature, time signature, pitches, and rhythms.

Each video will be of the same conductor. Three videos will include a sample, a video of the conductor mirror conducting with no conducting emblems (other than beat pattern and a cut off), and a video of the conductor using conducting emblems. The videos will be inspected by experts to ensure clarity. The videos will be presented behind the music, either on a screen

or using a projector, so that the conductor looks proportional to what the person would see sitting in an ensemble rehearsal setting.

Eye movements will be recorded on a technology similar to a Tobii TX300 Eye Tracker manufactured by Tobii Technology AB (Stockholm, Sweden). Both eyes will be tracked with as large a sampling rate as the technology allows. The data will be processed using manufacturer software. The data will be statistically analyzed for time spent looking at the music being played, ahead of the music being played, and at the conductor.¹

Audio recordings will be analyzed by experts to determine if the presence of a conductor had any effect on performance accuracy. Trials with imperfections will not be excluded. Errors will be counted based on a comparison of pitch and rhythm compared to the expected outcome.

Outcomes

The primary outcome should be maps of the fixation and saccade patterns of experienced musicians while sight-reading music with a conductor. This study is expected to correlate with previous studies concerning the fixation and eye-hand span of experienced musicians while sight-reading music with no conductor, such as that of Penttinen, Huovinen, and Ylitalo (2015). Based on the findings of Wurtz, Mueri, and Wiesendanger (2009), musicians are expected to reduce their eye-hand span due to the inclusion of additional information. A comparison of these two data sets, conductor and no conductor, should demonstrate that the presence of a conductor, regardless of the use of conducting emblems, changes the fixation and

¹ The basis of this methodology is the study performed by Penttinen, Huovinen, and Ylitalo (2015).

saccade patterns. Additionally, comparing the patterns of the two conducted exercises should provide different fixation and saccade patterns, giving insight to how the use of conducting emblems affects the person sight-reading.

A new variable for this study, compared to previous studies, is the inclusion of instruments beyond the previously tested pianists and violinists. It is not anticipated that the sample will be large enough to generalize about a specific instrument. The sample will hopefully be large enough to generalize about experienced instrumentalists at the location of the study.

The overriding question for this proposal is “Can performers respond to conducting gestures while performing on an instrument they have experience playing and sight-reading music?” Results of this study should propose future research concerning the combination of conducting and sight-reading. It should help conductors by giving more insight into the musicians in an ensemble. If experienced musicians are able to respond and include information from a conductor while still accurately performing the music, then conductors might have cause to provide more expressive information by using more conducting emblems. Conversely, if the musicians rarely or never fixate on the conductor, then time should be given after handing out a piece of music for the ensemble members to work through the music on their own.

References

- Benge, T. (1996). *Movements Utilized by Conductors in the Stimulation of Expression and Musicianship*, ProQuest Dissertations and Theses.
- Cofer, R. (1994). An investigation into the effects of conducting instruction with seventh-grade band students. *Southeastern Journal of Music Education*, 6, 107-118.
- Cofer, R. (1998). Effects of Conducting-Gesture Instruction on Seventh-Grade Band Students' Performance Response to Conducting Emblems. *Journal of Research in Music Education*, 46(3), 360-373.
- Goolsby, T.W. (1994) Profiles of processing: Eye movements during sightreading. *Music Perception*, 12, 97-123.
- Kumar, Anita B., & Morrison, Steven J. (2016). The Conductor As Visual Guide: Gesture and Perception of Musical Content. *Frontiers in Psychology*, 7:1049. doi: 10.3389/fpsyg.2016.01049
- Matthews, W., & Kitsantas, A. (2013). The role of the conductor's goal orientation and use of shared performance cues on collegiate instrumentalists' motivational beliefs and performance in large musical ensembles. *Psychology of Music*, 41(5), 630-646.
- Nápoles, J., & Silvey, B. (2017). Effects of conductor baton use on band and choral musicians' perceptions of conductor expressivity and clarity. *Journal of Research in Music Education*, 64(4), 474-486.
- Penttinen, M., Huovinen, E., & Ylitalo, A. (2015). Reading ahead: Adult music students' eye movements in temporally controlled performances of a children's song. *International Journal of Music Education*, 33(1), 36-50.
- Price, H. E., & Mann, A. (2011). The effect of conductors on ensemble evaluations. *Bulletin of the Council for Research in Music Education*, 189, 57-72.
- Price, H. E., Morrison, S. J., & Mann, A. (2011, February). *Effect of conductor expressivity on ensemble evaluations by nonmusic majors*. In M. Broton (Chair), *International Symposium for Research in Music Behavior*. Symposium in Barcelona, Spain.
- Price, H. E., & Winter, S. (1991). Effect of strict and expressive conducting on performances and opinions of eighth-grade band students. *Journal of Band Research*, 27(1), 30-43.
- Sidoti, V., & Forsythe, Jere L. (1990). *The Effects of Expressive and Nonexpressive Conducting on the Performance Accuracy of Selected Expression Markings by Individual High School Instrumentalists*, ProQuest Dissertations and Theses.

- Silvey, B., & Fisher, R. (2015). Effects of conducting plane on band and choral musicians' perceptions of conductor and ensemble expressivity. *Journal of Research in Music Education, 63*(3), 369-383.
- Silvey, Brian A., & Koerner, Bryan D. (2016). Effects of conductor expressivity on secondary school band members' performance and attitudes toward conducting. *Journal of Research in Music Education, 64*(1), 29-44.
- Sloboda, J.A. (1985) *The musical mind: The cognitive psychology of music*. Oxford, UK: Oxford University Press.
- Thompson, J. (2012). *The Effects of Conducting-gesture Instruction on High School String Orchestra Students' Recognition of and Playing Response to Common Musical Conducting Emblems*, ProQuest Dissertations and Theses.
- Vanweelden, K. (2002). Relationships between perception of conducting effectiveness and ensemble performance. *Journal Of Research In Music Education, 50*(2), 165-176.
- Wurtz, P., Mueri, R., & Wiesendanger, M. (2009). Sight-reading of violinists: Eye movements anticipate the musical flow. *Experimental Brain Research, 194*(3), 445-450.

Future questions not answered by this study:

- What conducting emblems will an instrumentalist respond to while sight reading?
- Will a musician prioritize specific conducting emblems while sight reading?
- Does playing a percussion instrument affect the results of an eye-hand span test?