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CONTENTS

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HEALTH AND WELLNESS IN HIGH SCHOOL AND UNIVERSITY MARCHING BANDS: A REVIEW OF THE PROFESSIONAL LITERATURE

Michael Thrasher and Troy Coppus

The culture of competitive intercollegiate athletics programs is a distinctive feature of the American system of higher education. Over the past two centuries, intercollegiate athletics in the United States has evolved into a complex, multibillion-dollar industry. The origins of this intricate enterprise are varied. Labaree (2017) suggested that due to unreliable patterns of public funding in the early history of American higher education, institutions needed "to develop an attractive brand and . . . [a] strong loyalty to that brand" (para. 7). Visible, compelling athletics programs helped to serve that purpose, ultimately prompting many students and alumni to become long-term supporters of the university. Consequently, "American students don't just attend an institution of higher education; they identify with it. It's not just where they enroll; it's who they are" (Labaree, 2017, para. 8).

Along with an array of individual and team sports, athletic departments in both universities and high schools typically foment a diverse assortment of complementary programs, such as cheerleading, majorettes, booster clubs, and marching bands. In many cases, such bodies develop their own cultures and make their own distinct contributions to the life of the institution. In one case study, Madsen et al. (2007) found that the opportunity for membership in a particular marching band was the most cited reason that students chose to attend a specific university, surpassing even the academic reputation of the overall institution as a motivating factor.

In 2024, the National Collegiate Athletic Association reported a total of 263 member institutions at the Division I level (134 in the "Football Bowl Series/FBS" category and 129 in the "Football Championship Series/FCS" category). NCAA Division II includes an additional 162 programs with competitive football programs. A majority of these programs also support marching band activities of various size and scope. Given this background and large population of participants, an increasing quantity of empirical research has examined the inherent physical, psychological, and psychosocial risks associated with this demanding student activity. Over the past three decades, more than 30 published studies have examined the physical and psychological aspects of marching band participation by American university and high school students. Given the rapid expansion of literature in the field, a review of the published literature would assist practitioners and administrators in assessing the risks related to marching band participation and in developing meaningful mitigation strategies. The purpose of this literature review is to examine the empirical, peer-reviewed literature exploring the prevalence of medical problems related to participation in American marching bands published between 1993 and 2024. Furthermore, concomitant policy recommendations proposed or inferred from these studies will be organized into a coherent framework.

Materials

The authors examined 34 empirical studies appearing in scholarly, peer-reviewed journals published between 1993 and 2024. Studies were included if they examined any aspect of musculoskeletal, non-musculoskeletal, or mental health issues relevant to university marching band participation and appeared in scholarly, peer-reviewed publications. Throughout the review, emphasis was placed on the identification and analysis of trends and common threads. Goals included synthesizing and summarizing the available data, thus facilitating advocacy at the local level and clarifying gaps in the literature that may require additional exploration.

Among the literature under review, four studies examined the topic from a general, comprehensive perspective, while 30 other studies focused on more specific aspects of marching band participation. The literature identified four broad categories of potentially deleterious effects: 1) musculoskeletal, orthopedic, and cardiopulmonary disorders; 2) hearing impairment; 3) hyperthermia, heat exhaustion, and heat stroke; and 4) mental health, including depression, anxiety, and eating disorders.

General Studies

One of the earliest general studies to undertake a systematic assessment of medical problems among marching musicians was conducted by Harman (1993). Although the sample size was small, the author reported a high occurrence of upper extremity, thoracic, and lumbar pain among participants, despite an average age of 24.9 years. While little difference was noted between male and female participants, members of the flagline (color guard) reported a higher rate of problems in most categories. In addition, average sound levels of 90-105 dB (with peaks exceeding 117dB) exposed participants to volume loads exceeding standards recommended by the National Institute for Occupational Safety and Health (NIOSH).

Shortly thereafter, Mehler et al. (1996) conducted a season-long case study of a university marching band with 337 members. The authors recorded 179 injuries over the course of the season, with the vast majority (85.5%) relating to the lower extremities. As with Harman, Mehler et al. found no substantive difference between males and females. However, injuries were far more common earlier in the season (39.1% occurred prior to the first football game) and were also more common among first-year members as compared to experienced members. Injuries appeared to spike on rehearsal days following extended breaks (e.g., after the Labor Day holiday).

Knapik et al. (2007) undertook a two-year study of musicians in the United States Army Band. This subject pool (n = 205) was not limited to marching musicians, but rather included components such as a chorus, string orchestra, jazz ensemble, concert band, and ceremonial band. In confirmation of Harman (1993), the authors reported a similarly high occurrence of problems related to the lower extremities, upper extremities, and lumbar region. Statistical

analyses revealed that contributing risk factors for injuries included higher participant body mass index (BMI) levels and less prior or concurrent physical exercise.

Perhaps the most comprehensive general study of collegiate marching artists, including both instrumentalists and ancillary support units, was conducted by Hatheway and Chesky (2013). Similar to prior studies, the authors reported a higher incidence of reported pain among color guard or flagline members as compared to instrumentalists. The authors also noted that music majors reported higher levels of pain as compared to non-music majors. Psychological stressors, including performance anxiety, were highest among percussionists.

Musculoskeletal, Orthopedic, and Cardiopulmonary Disorders

Fifteen published studies – the largest part of the literature – dealt with the occurrence of various musculoskeletal and orthopedic injuries among participants, as well as certain cardio-pulmonary, dietary, and dermatological issues. For example, Kilanowski (2008) studied a population of high school marching band students over a two-year period, with the most reported problems involving lower extremity injuries and skin irregularities. Based on the data, the authors recommended such interventions as a preparatory exercise regimen prior to band participation, adherence to nutritional standards during participation, attention to appropriate footwear (supportive shoes, synthetic socks, and cushioning insoles), and adherence to guidelines from the National Athletic Trainers' Association.

In a large-scale study of 1,379 collegiate marching band and color guard members, Beckett et al. (2015) found that 25% of participants reported a musculoskeletal injury that was incurred through marching band activities. The most injured areas were in the lower extremities, particularly ankles and knees. As with Harman (1993) and Hatheway and Chesky (2013), color guard members reported a higher overall rate of injury. In addition, higher BMI was identified as a contributing risk factor for incurring a musculoskeletal injury (Beckett et al., 2015). Likewise, Moffit et al. (2015) confirmed lower extremity injuries as the most common malady reported among a population of 154 marching band members. Notably, this study omitted color guard or flagline members. In this study, male participants were slightly more likely than female members to incur injury. In addition to observing marching band health guidelines from the National Athletic Trainers' Association, the authors also recommended that bands incorporate health support units into their programs, including qualified health staff, provision of first aid supplies, and accessible mechanisms for medical referrals.

Rhode (2017) conducted a meta-analysis of selected academic literature related to marching band health, citing studies by Kilanowski (2008), Beckett et al. (2015), Moffitt et al. (2015), and Mehler et al. (1996). Noting the prevalence of lower extremity injuries documented in these earlier investigations, the author advocated for the engagement of athletic trainers for all high school and university marching bands. While conceding that availability of athletic trainers, costs of engaging more personnel, and other factors were impediments to this initiative, Rhode

argued that the cost of inaction – in the form of high medical expenses and lost productivity – may exceed the cost of engaging sufficient health care support staff (Rhode, 2017).

Almeida et al. (1999) conducted a study of musculoskeletal injuries among 1,347 United States Marine Corps recruits. While this study was not specific to marching artists, much of the physical activity of these recruits, particularly in the early weeks of training, bore strong resemblance to the marching and drilling work of marching band camps. In addition, the average age of participants (19.1 years) was like the ages of university marching band participants. Among this population, 39.6% of participants reported some type of musculoskeletal injury during a twelve-week period, with the most common injuries occurring in the ankles/feet, knees, or legs. Like Knapik et al. (2007), high injury rates appeared during the earliest weeks of training, suggesting a particular susceptibility to injury during an abrupt onset of vigorous training (Almeida et al., 1999). The authors hypothesized a correlation between baseline fitness levels, prior exercise histories, appropriate footwear, and training terrain as contributing factors to musculoskeletal injury.

In consideration of the importance of athletic gear, Grier et al. (2011) undertook an investigation of the impact of footwear among members of the United States Army Band. In this study, 112 band members received alternative shoes with increased cushioning and breathability. While these specific shoes were not shown to provide a benefit in overall health outcomes, the high occurrence of foot-related pain and discomfort reported among band members could potentially be improved using appropriately-fitted athletic footwear.

The type of surface utilized for marching band rehearsal and performance has been shown to influence participant stability, predisposing participants to injury. For example, both Brancaleone et al. (2022) and Magnotti et al. (2016) found that unstable surfaces (e.g., foam pads) were correlated with impaired postural stability. If rehearsing on uneven grass fields, poorly graded concrete or asphalt, or substandard artificial turf, participants may be at an increased risk for ankle or knee injuries due to larger postural sway.

Regarding the overall intensity of aerobic activity in modern marching bands, Strand and Sommer (2005) conducted a study of physical activity intensity and heart rates among a population of university marching band students. Results indicated that students carrying instruments five pounds or heavier demonstrated a statistically significant higher peak heart rate than other students, although the levels of overall physical activity did not meet the United States Surgeon General's recommended level of daily physical activity. The extremely small sample pool of this study (n = 16) and location in a cooler Upper Midwest climate may limit its generalization to the broader university marching band population. In contrast, Cowen (2006) studied a sample of 49 university marching band students in the hot, arid climate of the American Southwest. This study specifically tracked daily steps by band members, with total pedometer-tracked steps averaging 13,259 steps on rehearsal days and 16,175 steps on football gamedays. These totals exceed the 10,000 daily steps suggested by public health guidelines, indicating an

overall physical activity level consistent with exercise recommendations.

Dye and Barry (2016) found that drum corps percussionists experienced a greater rating of perceived exertion (RPE) when performing without metronome assistance, even though their measured heart rates remained consistent. This suggests that the increased psychological attention and focus required to perform complex music in a performance setting may increase the perceived intensity of the activity. Another study of physical exertion conducted by Erdmann et al. (2003) found that high school marching band students expended approximately 4.5 to 6.0 metabolic units (METs) during marching activities. As one MET equates to the rate of energy expenditure for an individual at rest, marching maneuvers correspond to moderately vigorous physical activity for adolescents.

Due to the intensity of marching maneuvers, cardiopulmonary health has also been identified as an area of interest. In a study by Sharma et al. (2008), researchers identified the presence of cardiovascular risk factors among a population of 232 university marching band students. Specifically, 45% of the students were found to be overweight or obese and around 8% were hyperglycemic. Other commonly reported markers included high cholesterol, elevated waist-to-hip ratio, and high systolic and/or diastolic blood pressure (Sharma et al., 2008). A high incidence of alcohol use among the participants, combined with the insufficient consumption of whole grains, fruits, vegetables, and water, suggested a need for dietary interventions for marching band students. Similarly, McConnell et al. (2017) found that a population of both elite Drum Corps International participants and non-elite university and high school band members were not meeting recommended dietary guidelines. Out of 356 participants, only 1% had Healthy Eating Index (HEI) scores greater than 80, which classified as "good" (McConnell et al., 2017). Just one participant met the daily recommended intake of whole grains, while a large percentage of individuals in the study exceeded guidelines for the consumption of sodium and "empty calorie" foods (McConnell et al., 2017).

Finally, Wyant et al. (2022) studied sun exposure and melanoma occurrence among university marching band members. Participants included 859 members and alumni of five university bands in the state of Florida, which frequently experiences high heat, humidity, and sunny conditions. The authors found that only 16% of current band members and 27% of alumni consistently wore sunscreen (Wyant et al., 2022). Additionally, alumni self-reported a 1.66% increase in the appearance of melanoma compared to the general American population (Wyant et al., 2022). These results indicate a need for greater awareness of sun exposure and increased use of high-SPF sunscreen products for band members.

Hearing Health

Due to the excessively high levels of sound production in university marching bands, hearing health has been an area of increasing concern. The largest American marching bands may exceed 500 members, involving large sections of brass instruments and extensive use of

percussion. In some instances, electronic amplification may also be incorporated for particular instruments or sections. Consequently, the volume levels produced by marching bands may far exceed the loads created by symphony orchestras or concert bands.

Early and Horstman (1996) examined sound exposure among members of a university marching band, two high school marching bands, and a percussion ensemble. In a majority of measurements, volume loads were shown to exceed Occupational Safety and Health Administration (OSHA) allowable limits for safe exposure. Similarly, Walter (2011) found that 15 of 16 participants in a high school marching band experienced sound levels greater than safety standards as established by NIOSH, with some students experiencing daily means of more than 800% beyond the maximum recommended dosage.

Washnik et al. (2021) studied noise dosages among a sample of musicians in a university marching band during both rehearsals and performances. The authors found that all the band members experienced volumes in excess of NIOSH guidelines, with some more than 300% beyond safety standards. In addition, exposure levels among the band members and band director were found to be more severe on game days as opposed to rehearsals. Both Washnik et al. (2021) and Russell and Yamaguchi (2018) speculated that the additional sounds of a gameday experience (large crowds, public-address systems, etc.) may make football game performances even more dangerous to participants.

In addition to band members, instructional and support staff members may also be exposed to dangerous sound pressure loads. Russell and Yamaguchi (2018) examined the sound exposure of eight athletic trainers working with a large university marching band program. Data indicated that those individuals experienced sound exposure far surpassing safety levels as recommended by NIOSH. The authors recommended the implementation of sound conservation and mitigation strategies for all band personnel, including instructors, equipment managers, and corresponding health care staff.

Convincing marching band personnel to adopt sound conservation strategies has proven to be difficult. For example, Russell and Yamaguchi (2018) reported that more than 50% of the band participants surveyed conveyed little to no concern with hearing loss, and only around 8% frequently wore hearing protection. Auchter and Le Prell (2014) studied the impact of the "Adopt-a-Band" training program on the hearing conservation behaviors of high school marching band students. The "Adopt-a-Band" program involved the distribution of training materials, videos, and fact sheets designed to promote hearing protection. Results indicated a large increase in the number of students who expressed an intent to wear hearing protection on a more regular basis, although the actual behavior change fell considerably short of their stated intent (Auchter & Le Prell, 2014). In a similar study of university band members, Seever et al. (2018) also found that the "Adopt-a-Band" program evoked an increase in band members' intention of using hearing protection. However, participants' long-term, consistent adoption of such mitigation strategies was less clear.

Hyperthermia, Heat Exhaustion, and Heat Stroke

Band programs in the southern, southeastern, and western portions of the nation commonly experience weather with high temperature and/or humidity patterns. Furthermore, climate change may be further aggravating conditions, with average temperatures in the contiguous 48 states showing a steady increase since the early 1990s. (United States Environmental Protection Agency, 2025). Consequently, some marching band members may be exposed to dangerously high heat levels for several months per year, potentially placing them at risk for hyperthermia, heat exhaustion, or heat stroke.

Such concerns have led to recent explorations of heat-related dangers for band members. Merchant et al. (2021) found evidence of almost 400 exertional heat illnesses among high school and collegiate marching band participants in the United States over a 30-year period. The findings were compiled by surveying news reports, potentially indicating that the actual number of incidents may have been substantially higher due to unreported cases. Emerson et al. (2021) further examined core body temperatures and the occurrence of exertional heat illness among a sample derived from two university marching band programs. Data indicated that participants experienced high core temperatures, with a peak level of 41.2°C (106.2°F) during game conditions. In addition, more than 60% of participants reported for game performances under states of hypohydration, indicating the need for greater fluid intake. The authors recommended the engagement of athletic trainers to implement preventative measures.

Similarly, Yasuda and Ito (2018) found that many collegiate band members in a 58-participant study reported to band rehearsals under a state of fluid deficit, suggesting a need for greater hydration prior to outdoor practice sessions. Furthermore, evidence indicated that hydration status measured by urinary biomarkers was unrelated to the instrument played or position occupied by the student (Yasuda & Ito, 2018).

Regarding hydration, Vepraskas (2002) commented on the inherent difficulties of hydration breaks in marching band rehearsals, given that the momentary absence of even a few students for rest breaks makes rehearsing large block formations difficult. To address this problem, a case study was conducted in which all high school marching band students carried water bottles in insulated belts during rehearsal sessions. This was combined with an educational program on the importance of hydration and the risks of prolonged heat exposure. Although statistical data were not collected, anecdotal reports indicated that the number of heat-related illnesses decreased after the implementation of the intervention (Vespraskas, 2002).

Mental and Psychological Health

The area with the least amount of epidemiological research relates to the mental, psychological, and psychosocial aspects of university marching band participation. However, new studies have recently appeared, in accordance with an increasing awareness of mental health

risk factors among college-aged students. Levy et al. (2011) examined musical performance anxiety among a population of competitive drum and bugle corps members. Results indicated that marching artists experienced performance anxiety at a lower rate than other types of performers, such as those in symphony orchestras. Members of the color guard, flagline, or dance team were shown to experience performance anxiety at a much higher rate than their instrumentalist peers, perhaps due to the greater visibility of their work and the conspicuousness of any errors (Levy et al., 2011). Consequently, the authors recommended the incorporation of anxiety-reduction strategies and training into marching band programs.

Uriegas et al. (2021) found that a sample of university marching band members were more at risk for various eating disorders than other athletes. Female members displayed higher prevalence rates than males. Furthermore, many band members demonstrated pathogenic behaviors associated with eating disorders, including dieting (48%), excessive exercise (21%), binge eating (19%), and purging (12%). These factors, combined with the tendency towards hypohydration and poor diet as documented in other studies, may further imperil the health of marching band members (Uriegas et al, 2021). Consequently, the authors also recommended health support staff, such as athletic trainers and/or team physicians, engaging with marching bands and implementing robust educational programs on the prevention and treatment of eating disorders.

More recently, two studies examined the impact of the Covid-19 pandemic on marching band participants. Garver et al. (2021) found that university marching band members experienced higher levels of anxiety and stress during the disruption as compared to other college student-athletes and measured highly on depression scales. As with other studies, females reported higher rates of mental health impacts than did males. Similarly, Cumberledge (2021) studied 765 marching band students drawn from across ten universities during the pandemic-affected Fall 2020 term. Most students felt that the sense of community in their bands had been impaired as compared to previous seasons. The loss of togetherness, socialization, and cherished traditions may have potentially put these students at greater risk for mental health problems. Moore et al. (2024) examined mental health seeking attitudes in the collegiate marching band population. The authors found that the primary mental health help-seeking barriers for marching artists were not having time to seek help and that mental health services were not available when these participants could attend (Moore et al., 2024). Collectively, these studies suggest the ongoing need for mental health assessment, education, and support for university marching band students.

Implications and Recommendations

In these 34 studies, a pattern of health risks to marching band participants becomes readily apparent. The literature also either implies or expressly articulates several recommendations to address these threats.

Prior to participation, marching band participants should undertake adequate pre-

participation preparation, which could include off-season physical exercise regimens, as well as undergoing a qualified medical assessment to identify any preexisting health problems (Mehler et al., 1996). Once rehearsals begin, bands should observe guidelines as established by the National Athletic Trainers' Association (Kilanowski, 2008). This may include the engagement of appropriate health support resources, including qualified health staff, provision of first aid supplies, and mechanisms for medical referrals (Moffitt et al., 2015). In addition, athletic trainers should be on hand at all outdoor rehearsals and performances (Emerson et al., 2021; Uriegas et al., 2021).

Students should use appropriate footwear at all rehearsals and performances, which may include cross-training athletic shoes, socks made from synthetic or moisture-wicking fabrics, and cushioning insoles (Mehler et al., 1996; Kilanowski, 2008; Grier et al., 2011). All participants and staff members should utilize high-SPF sunscreen products whenever rehearsing outdoors (Wyant et al., 2022).

Dietary observations, including adequate consumption of whole grains, fruits, vegetables, and water, in compliance with public health standards, are particularly important for marching band students (Sharma et al., 2008). Proper hydration prior to commencing rehearsal or performance is essential (Yasuda & Ito, 2018; Emerson et al., 2021). Professional associations should establish statewide or national recommendations for the frequency of rest and water breaks (Hatheway & Chesky, 2013). Hearing conservation interventions should be implemented for all participants in marching band programs, including band members, instructional staff, and support staff, including athletic trainers and healthcare providers who monitor participants (Russell & Yamaguchi, 2018).

The literature indicates that color guard and flagline members are at higher risk of injury than instrumentalists, and may need additional remediation (Harman, 1993; Hatheway & Chesky, 2013; Beckett et al., 2015). In addition, higher participant BMI levels are positively correlated to prevalence for injury (Beckett et al., 2015).

Finally, all pre-service instrumental music education degree curricula should include training in the national objectives for physical education from the National Association for Sport and Physical Education (NASPE) (Vepraskas, 2002; Hatheway & Chesky, 2013).

One glaring gap in the literature for this population is objective data for marching band participants during activity. There is an abundance of inexpensive, validated equipment for physiological data collection available. This equipment can be used to monitor marching band participants in real time to get a clearer picture of the physiological workload placed upon them. There are also many free tools to regularly collect subjective data that can provide the participant's perspective on their activity. Those objective and subjective measures could then elucidate methods of maximizing safety and optimizing performance for band participants. These measures have long been used among collegiate athletic teams, which was the impetus for

the field of sports science. It is reasonable to think that the large population of marching band participants, at risk for injury and illness for the various reasons shared in this paper, should also undergo objective data collection and analysis to promote a safe and optimal performance environment for these individuals.

Demographics suggest that thousands of students participate in marching bands in the United States. Faculty members and institutional leaders have an ethical and moral mandate to promote the safety, well-being, and success of these students. Data-informed remediation practices have the potential to promote healthy, sustainable outcomes for both students and other stakeholders.

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RUBATO IN ENSEMBLE PERFORMANCES OF *YORKSHIRE BALLAD*

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Musical performance is one of the most intricate and highly developed skills in which a human can engage. High-level performances require thousands of hours of focused practice, not to mention the many hours of instruction. The performer must master not only the technical demands of their instrument, but also the stylistic and expressive conventions across the diverse genres and styles they may be expected to perform. Conductors face the challenge of joining large groups of individual musicians, each with their own instruments and prior experience, to create a unified interpretation of musical works (Green, 1992; Slatkin, 2012). The conductor must consider their preparation for all rehearsal contingencies leading to a cogent performance for every composition. Among many others, one crucial factor in a high-quality musical performance is the tempo selected. Several researchers have investigated the chosen tempo of ensemble performances (Berz & Ferrara, 2006; Confredo et al., 2021). While tempo markings provided by a composer on the score serve as an approximate beginning for interpretation rather than strict guideline (Gabrielsson, 1974), conductors must also take into account other preparation factors, such as the specific ensemble they are working with, the performance venue, and the relationships between the chosen piece and the overall program (Collier & Collier, 1994; Confredo et al., 2021; Geringer et al., 2016; Geringer & Johnson, 2007; Schuller, 1997).

Beyond the general tempo chosen by a conductor for a piece, there also exists the concept of tempo deviation, an inherent element in every performance (Repp, 1990; 1999). Though there are often clearly marked large-scale changes, such as accelerando or ritardando, countless micro-level variations occur throughout each rendition of every playing (Gabrielsson, 1974; Palmer, 1989; Repp, 1999). Considerable evidence indicates that these minute deviations in the musical flow play a crucial role in shaping the listener's perception of the emotional impact of a performance (Johnson, 1996b; Repp, 1990; 1992). This aspect of tempo and deviations in tempo as related to musical expression is central to this study.

Substantial research documents the patterns of rhythmic variation in solo musical performance. The extant research has not only encompassed a stand-alone performer, but also soloists with accompaniment (Gabrielsson et al., 1983; Johnson, 1996a; 1999; Palmer, 1989; Repp, 1992; 1999; Shaffer, 1981). Consistent findings indicate that performances featuring well-chosen tempo variations are perceived as more musical compared to those with less preferred rubato patterns (Johnson, 1996b). Researchers have determined that there is a degree of common practice across performances but attempts to establish universally applicable rules for this common practice have been unsuccessful (Johnson et al., 2012; Povel, 1977; Repp, 1998). It is suggested that any existing rules are closely tied to genre and style and are mostly developed

through the experience and intuition of individual performers (Repp, 1995; 1999). This flow has been compared to musical structure, but Schuller (1997) suggested that these rubato patterns may extend beyond mere connections to structure or genre, proposing instead that melody and temporal flow are deeply intertwined.

In an earlier study, we designed an investigation to examine tempo flow and conducted rubato within an ensemble setting (Johnson & Geringer, 2023). Volunteer participants from three levels of expertise were asked to learn and conduct the first 40 measures (10 phrases) of the *Yorkshire Ballad* by James Barnes. We used the software program, *Einsatz* (Kawaguchi, 2016), specifically developed for studying conducting timing patterns. Participants' arm motions were detected by a Wii™ controller and used in real-time to control the tempo of an audio recording. Consequently, conductors controlled only the rhythmic flow/onset of each sequential beat. Participants conducted a series of practice trials and chose their most musical performance of the excerpt, which was analyzed to ascertain their timing tendencies. Results revealed consistent patterns in the conductors' rubato that could be related to both the structure of the phrases as well as the overall structure of the composition. We determined that analysis of the use of rubato in an ensemble setting could uncover interesting relationships between these conducting events and previous studies of solo performances. We speculated that findings may reveal whether rubato tendencies in group performances conform to common practice expectations noted in solo presentations. The previous study clearly demonstrated that conductors, both experienced and beginner, used similar patterns of tempo throughout their performance. Individual differences among the conductors seemed to represent mainly variations around a common standard, but that standard timing existed for all participants. It was hypothesized that this standard set an expectation that allowed groups of performers to perform together with no previous experience either with the individual composition or previous performance experience as a group.

There are two aspects of this previous study which should be further considered. The first is the aspect that every conductor in the study was working with the same exact band (or instrument). Every different instrument has differing characteristics. A violin and a French horn initiate every note in a different way based the inherent physical properties of each instrument (Piston, 1955). In the previous investigation, all conductors were working with the same instrumentation as the stimulus. The rhythmic tendencies observed in those recordings could have been affected by the fact that the identical stimulus band might have influenced some musical decisions. It is possible that having had more/different band recordings might lead to different rhythmic choices.

A second consideration is that everyone in the previous project knew that they were conducting for a research project. While every conductor was tasked with creating the most musical product they could, there was no question but that their performance was linked to the experimental technology, and they knew others would be evaluating their musical choices. It was not a musical experience solely for the purpose of making an aesthetically beautiful performance. While previous research has shown that there are parallels between recordings of

performers playing solely for the musical performance and performers playing knowingly for research purposes (Repp, 1995), those comparisons might not necessarily hold up in different contexts. To date, no study examines whether group rubato in an ensemble setting will have the same characteristics when performed for aesthetics versus for research. There is no doubt that group micro variations in tempo must axiomatically be more complex than those made by a solo performer; to date, no research has even documented its existence.

The purpose of this study was to determine what patterns of rubato in ensemble performances exist in performances created solely for the musical performance. The research questions guiding this investigation were: research question (RQ) 1) Are there changes in tempi across phrases and are these changes consistent between different ensembles; RQ 2) Are the changes in tempo rubato seen in identified phrase groups similar between the bands in the finest performances available; and RQ 3) Are patterns of tempo rubato noted in recordings to patterns noted in previous research-generated performances of *The Yorkshire Ballad*?

Method: Phase 1

Stimulus Selections

The stimulus excerpt chosen for this project was *Yorkshire Ballad* by James Barnes. This is the same stimulus used in the previous investigation (Johnson & Geringer, 2023) The original reason for selecting this piece again was that it was patterned such that phrases could be compared from iteration to iteration. The first 40 measures of the piece contain an opening AABA section, which was then re-orchestrated and repeated (AABA). The work closes with a different orchestration of the AA section. It was also chosen because the piece is a staple in band literature.

Forty-five different audio and audio/video recordings of the *Yorkshire Ballad* by wind ensembles were acquired digitally, with a considerable number accessed on YouTube.com. Included in the original total were performances by middle school, high school, college, and professional ensemble musicians. From these 45 recordings, three experienced wind band educators selected the "most musical" performances. While there was an original thought to choose the top 12 pieces, there was a distinct break after the top eleven recordings and the rest, so a determination was made to consider only the performances above that break. The index of agreement between the three adjudicators for the 11 selected pieces was very high, .88. The final eleven performances included 2 professional ensembles, 5 collegiate ensembles, and 4 high school ensemble performances. All 11 performances were rated as musically outstanding.

Procedure

The next step was to code the onset of each beat in the recordings. Because this piece has numerous overlapping lines with slurred attacks, many of which occur at instances other than

at exactly determinable millisecond points, we used a somewhat novel technique to obtain the inter-onset interval (IOI) between each beat of the first 160 beats of the piece. An inter-onset-interval is the exact time a beat begins until the onset of the next note played. To most closely approximate an accurate coding of the point each beat begins, we listened to each of the 11 performances multiple times until we could tap the performed beat beginnings in synchrony with the ensemble, as if we were performers in the ensemble. Each performance was tapped and recorded three times: twice by one member of the team, and a third time independently by another team member. This procedure resulted in 33 tapping performances (11 ensembles each tapped 3 times) of the 160 beats and allowed both intra- and inter-observer reliability to be calculated for each performance. The taps representing the points in time of each beat were then converted to IOI durations using a newly developed software program, *Taps*, created specifically for this project (Weingarten, 2022). We tested observer reliability for each of the 11 performances using a series of repeated measures ANOVAs. We found no significant differences in IOI between repeated tapping performances of the same person and the independent observers for any of the ensembles, $F\ (2, 318) \leq 1.9$, $p \geq .14$. In eight of the 11 analyses, *F*-ratios were less than 1.0. For subsequent statistical analyses, we used composite values (*means*) of the three tapped performances to determine inter-onset interval values.

Results: Phase 1

The primary aim of the first phase of this study was to answer the first research question: Were there changes in speed across phrases and were these changes consistent? Based on observations made in the previous study of conductors (Johnson & Geringer, 2023), we wanted to compare beat durations of the beginnings and endings of phrases with the middle measures of phrases. Each phrase consists of 4 measures with a total of 16 beats. We first compared the first and last measures (8 beats) with the middle two measures (8 beats) of all eight A section phrases. We found a significant difference in IOI between the phrases, $F\ (7, 224) = 13.06$, $p < .001$, $h^2_p = .29$, and a difference between the outside and interior measures in the phrase, $F\ (1, 224) = 28.57$, $p < .001$, $h^2_p = .47$. There was not a significant interaction between phrases and position of measures. Beat durations in phrase beginnings/endings ($M = 1.01$ *s*) were slightly but consistently longer than durations in the middle of phrases, ($M = 0.99$ *s*). Differences between individual phrases and the 11 versions, although significant, were not our focus in this study, and also did not interact with where they occurred within the phrases.

We then repeated this analysis with the two B section phrases, which resulted in a similar significant difference between beat note positions, $F\ (1, 22) = 21.90$, $p < .001$, $h^2_p = .49$. There were no differences between the two B phrases, or interactions with beat position. Once again, beat durations in phrase beginnings/endings ($M = 1.01$ *s*) were longer than durations in the middle of phrases, ($M = 0.99$ *s*).

As these analyses would imply that 1) there were changes in tempo across the performances of phrases and 2) mean IOI times show similarities, it was determined that looking

more closely at specific patterns of tempo rubato change might be enlightening regarding similarities across performances. Thus, we initiated Phase 2 of this study.

Method: Phase 2

Stimulus Selections

As a subsequent refinement, the six researchers listened carefully to all 11 recordings of the piece and chose the three most musically expressive performances. All six unanimously agreed, albeit in slightly different orders, that the top three performances were those by ensembles from University of North Texas, Drake University, and Tokyo Kosei.

Results: Phase 2

First, we replicated the analysis from Phase 1 with only the three selected performances to confirm that the earlier reported results were consistent with these more selective performances (RQ #2). Comparisons of the onset intervals in the A section phrases of the three ensembles selected as the most musically expressive found significant differences between the eight phrases, $F\ (7, 42) = 35.13$, $p < .001$, $\eta^2_p = .85$ and phrase position within the AABA grouping, $F\ (1, 6) = 7.98$, $p = .03$, $\eta^2_p = .57$. Once again, beginnings/endings of phrases were found to have longer IOIs than beats in the middle of phrases. Differences were also found between the three versions, $F\ (2, 6) = 257.55$, $p < .001$, $\eta^2_p = .98$. Perhaps not surprisingly, there were also significant two-way interactions (phrase by version, and phrase by position), which may provide some material for further study of these "most expressive" versions. In the latter interaction, two of the phrases (the first and the fourth A section phrase) had slightly longer phrase middle IOIs than beginning/ending IOIs.

Analysis of B section phrases performed by these three ensembles showed no significant effect of phrase, but again, a main effect of beat position within the phrase, $F\ (1, 6) = 34.84$, $p < .001$, $\eta^2_p = .85$. There were no two- or three-way interactions, but a difference was found between the three performances, $F\ (2, 6) = 28.23$, $p < .001$, $\eta^2_p = .90$.

We then compared performances from the earlier conductor study (Johnson & Geringer, 2018) to these select performances to determine whether these three performances aligned with the rhythmic tendencies identified in that previous analysis (RQ #3). Overall mean differences in IOIs between North Texas and Drake were relatively small (M =1.03 *s* and 1.04 *s*), both longer than Tokyo Kosei beat durations (0.95 *s*). Those differences are shown in Table 1. It should also be noted that the ratio of rubato used to the performance tempo was higher in the two somewhat slower recordings than it was in the previous investigation.

Patterns of tempo rubato noted in recorded performances and those performed in the earlier conductor study were compared by graphing IOIs. A graph of the mean onset timing

for the three performances is shown in *Figure 1a*. Similarities between all three groups are evident, though the onset timing for Tokyo Kosei can be seen to be a little different. The inter-item correlation between the performances of North Texas and Drake was .43, while the relationships between Drake and Tokyo, and North Texas and Tokyo were much less, at .24 and .16 respectively. The similarities and differences in timing fluctuations can be discerned visually. Also included is the graph of the performances from the previous investigation (see *Figure 1b*). Though the magnitude of rubato differs between performances, the variations occurred in almost same place temporally, and in the same direction, for all performances.

In order to look at the rubato usage more closely in terms of phrases, we examined the phrases based on results of a factor analysis. Results from the previous investigation found that phrases 1, 2, 4, 6, 8, and 10 all loaded on one timing factor, phrases 5 and 9 loaded on a second, and phrases 3 and 7 loaded on a third. Timing for those phrases were again combined and created overall timing contours for the previously named A, A1, and B phrases to examine similarities and differences. Figure 2a illustrates the temporal fluctuations in the three performances in this investigation. Figure 2b illustrates those same phrases from the previous conducting investigation.

Discussion

This study is the second that investigates temporal patterns in musical performance within an ensemble context. However, this is the first study to use recordings made for artistic purposes as the stimulus to be examined. Working with these publicly available recordings adds a level of authenticity to the project but also creates some logistical problems. When the sound waves from the recordings are put in a musical editor to determine onsets, one becomes immediately aware of how inexact group performances are. Determining the millisecond of an onset is impossible given the discrepancy between individuals and sections. It can be approximated, but that onset point can shift by several milliseconds in future attempts. Our present solution was to listen carefully multiple times, learn the performance timings, and tap along as if performing with the ensemble. This activity appears to generate a more reliable set of onset times as evidenced by our findings. This was true not only within individuals tapping performances, but also between the different musicians tapping their onset timings.

The researchers were surprised by the vast number of recordings of the *Yorkshire Ballad* available. While we believed that we would not have a problem finding recordings, the number of recordings was surprising. Given the number of recordings, it was fortunate that there were breaks in the performance qualities that allowed for such clean choices for both phases of the study. Authors noted that there were differences in performance quality between the two collegiate bands and the professional ensemble in phase 2 of the project. However, that outcome might well have been predictable, due to the ability levels of the bands.

The first research question asked whether there were changes in tempi across individual

phrases and if those changes were consistent. Results indicated that the performances of phrases started somewhat slowly and accelerated slightly through the first half of the phrase, and then slowed again at the end of the phrase. This finding was consistent in both the A as well as B phrases. Though the tempo changes were very slight, they were consistent enough to have found statistical significance. Whether or not this pattern exists in other band pieces would be purely speculative, but the consistency of this pattern in this piece is reflective of the structure/overall form of the composition. It is therefore reasonable to speculate that a relationship exists between the rhythmic pattern and the structural pattern.

The second research question was whether the changes in tempo rubato seen in the most musical performances were similar in their timing choices. In this case the two performances by college ensembles were very similar, but the performance by the professional band was somewhat faster and had slightly different timings. It has been hypothesized that slower tempi allow for larger timing changes, and that faster performances are constrained by the more rapid tempi. This may be the case in these differences, but the overall tempo does not explain all of the noted variation. In the middle of some phrases the direction of the change is slightly inverted, but the opposite, nonetheless. Reasons for this are not clear, but it is suspected that ensembles at this caliber reject some norms. However, the parallels greatly outweighed the differences, and it is still the authors' belief that there is a common practice operating in these performances overall.

The final research question was whether the patterns of tempo rubato noted in recorded performances were similar to patterns noted in previous research-generated performances of the *Ballad*. The comparisons of the tempo changes seen in Figure 1A and Figure 1B are remarkably similar. There are notable slowed tempo moments that occur at the changes of phrases across most of the performances. Some have a greater visual slope than others (see Figures 2a and 2b), and the differing performances show that those larger changes in tempo are similar across performances and groups. Moments of acceleration are likewise similar, and the slopes are parallel as well. While faster tempi seem to attenuate the magnitude slightly, the overall shapes imply commonality. This parallel commonality implies the presence of some generally agreed-upon common practice among both settings. One might question whether the observed similarities in performance are simply the result of a standard interpretation of the piece. However, evidence from the prior study suggests otherwise: conductors who had neither seen the score nor rehearsed the work made temporal decisions that closely aligned with those of experienced conductors represented in the reference performances. This makes it unlikely that adherence to a standardized approach was the primary influence on the choices made by these less experienced individuals. While we do not claim that a technologically facilitated performance replicates the nuances of an organic one, the patterns of rhythmic variation nonetheless reflect a parallel relationship in the timing decisions.

The parallels found between the performances created solely for musical recordings and the preprepared band performances are promising, as they imply the hypothesized common rhythmic practice that transcends the differences between a contrived conducting experience and

a performance created solely for musical purposes. While no person is likely to claim that every phrase starts at a slower tempo, accelerates to the middle of the phrase and then slowly return to the original tempo by the end of the phrase, that pattern clearly happened repeatedly, over the many phrases of this piece, in many different environments (see Figures 1a and 1b). The question is not whether that happened, but why? In the original study (Johnson & Geringer, 2018), most of the participants had never conducted the piece, yet they gravitated to the same rhythmic fluctuations that the very experienced university band directors utilized. However, while there was a clear acceleration at beat 8 in many phrases by the very finest performances, the conducted versions in previous research did not contain these tempo variations.

These patterns are even more evident when looking at the overall performances of phrases. They show the temporal changes in the performances that paint clear pictures: the slight pauses at beat 10 in the A phrases, the more "W" shaped B phrases, and the larger change in tempo in the A^1 phrases. While each performance is different, the overall similarities are marked. Directional tendencies of different magnitudes exist, but these are parallel tendencies, seen primarily in the 16 beat points, and less in the center of the phrase, at the 8 beat points. There is also a slight change that appears to exist between the first, second, and third sets of 64 beats. The second section was performed faster than the first; and the third faster still. The IOI difference from the first to third sections is 0.09 seconds per beat. That difference was consistent among both the performed as well as the recorded performances.

The first conclusion we can draw from these results is that the conducting technology used in the earlier study of the *Yorkshire Ballad* functions the same way as the prepared piano in the work of Repp (1995). In this case, the performances created by the conductors in the earlier study contained the same rubato tendencies that were found in the YouTube recordings. This finding is important because once again we have found musicians tend to create performances of similar musicality whether in a laboratory or on a stage. The research technology has once again shown not to be a variable that distorts the intended performance.

The second conclusion seems even more consequential. Most performers at a high level enjoy performing with other people who perform equally well. It has often been thought that great performers maintain the tempo and play very closely together in ensembles (Keller, 2014). However, in the case of 11 performances included in this study, the groups would not necessarily be considered "advanced." While the three finest performances in this study are excellent in most every way, the other eight bands produced very good performances. While not at the highest level, they were able to play together and produce very clean performances. However, we also see in these figures that those most musical performances, while clean, are not absolutely steady. The tempo fluctuates very much. It is unknown how these groups knew how to fluctuate together, but clearly, they did. If we go back to the initial study, which included students conducting this piece for the first time, they also incorporated these same rubato patterns. The question of how this experienced group, or those young conductors, knew when the next note should be attacked is a fascinating aspect of musical performance to consider.

The *Yorkshire Ballad* was initially selected for this study because of its prominence in the band repertoire and its highly patterned form, which features substantial repetition. At the outset, we hypothesized that if rubato were linked to a common rhythmic practice associated with musical structure, it would be possible to identify consistent patterns. This hypothesis was supported by our findings. While it is unlikely that the specific rubato patterns observed in this piece apply universally to all musical contexts, the results suggest that performers may engage in these fluctuations instinctively, provided they are attuned to the underlying rhythmic flow. Musicians can certainly perform effectively without explicit sensitivity to this temporal ebb and flow, but those who are aware of it may enhance the perceived musicality of their performances.

This study is the first to demonstrate such findings in an ensemble context. It suggests that conductors might be more effective if they were to consider not only the initial tempo when preparing a performance, but also the incorporation of the ebb and flow of rubato throughout the piece. Although this remains a challenging and emerging area of research, the evidence indicates that greater sensitivity and intentionality in this domain can significantly benefit the perceived musical effect of the ultimate performance.

Common-practice tempo fluctuations remain a compelling topic. We still do not fully understand how they are learned or implemented, but a key contribution of this study is the recognition that they are indeed an integral part of ensemble performance. Continued research in this area is clearly warranted.

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Table 1

Mean Onset Times per Beat for Ensemble Performances and previously examined Conductor Experience Categories

Category	*Mean* onset time	*Standard Deviation*
Ensembles:		
Drake	1.04 (seconds)	0.08
North Texas	1.03	0.09
Tokyo	0.95	0.08
Conductors:		
Graduate	1.05	0.07
Professional	1.16	0.09
Undergraduate	1.23	0.09

Figure 1a.

Mean Note Onset Times for the Three Selected Performances

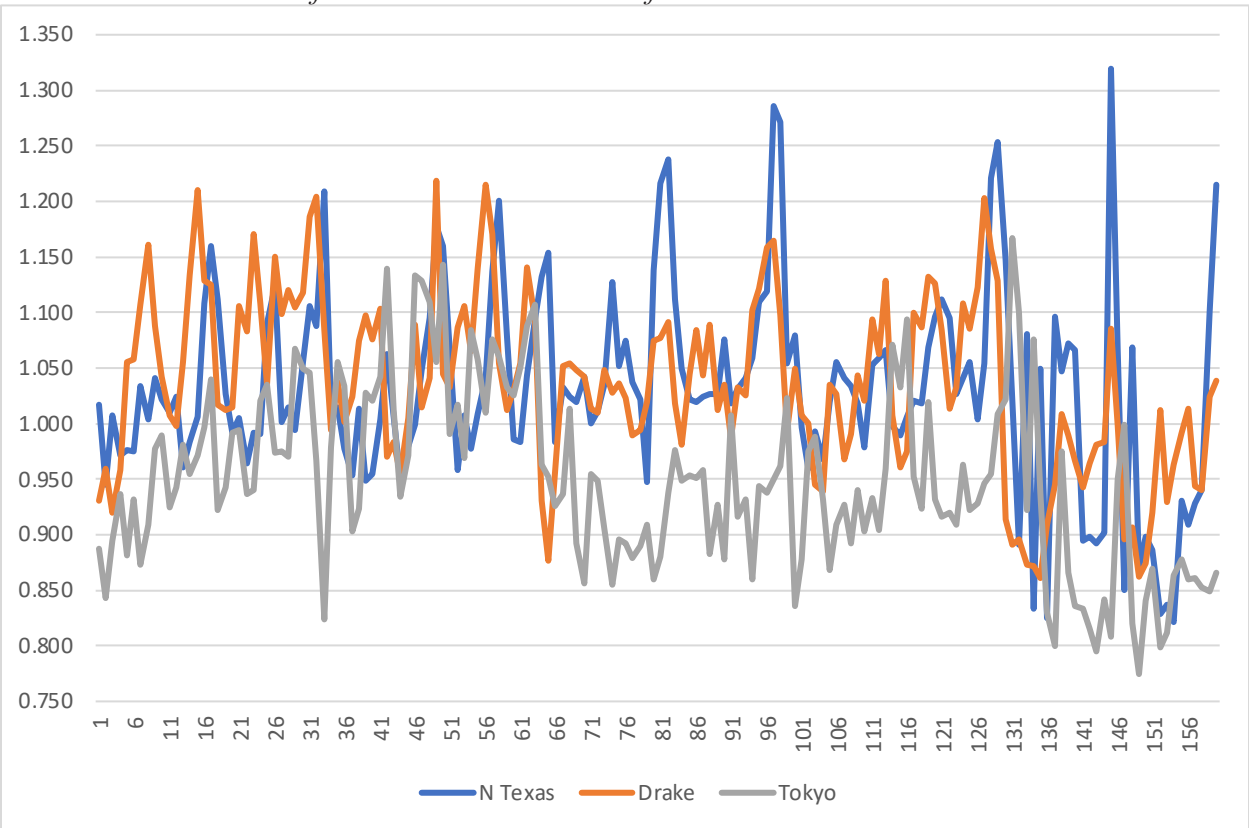


Figure 1b.

Mean Note Onset Times for the Previously Examined Conductor Performances

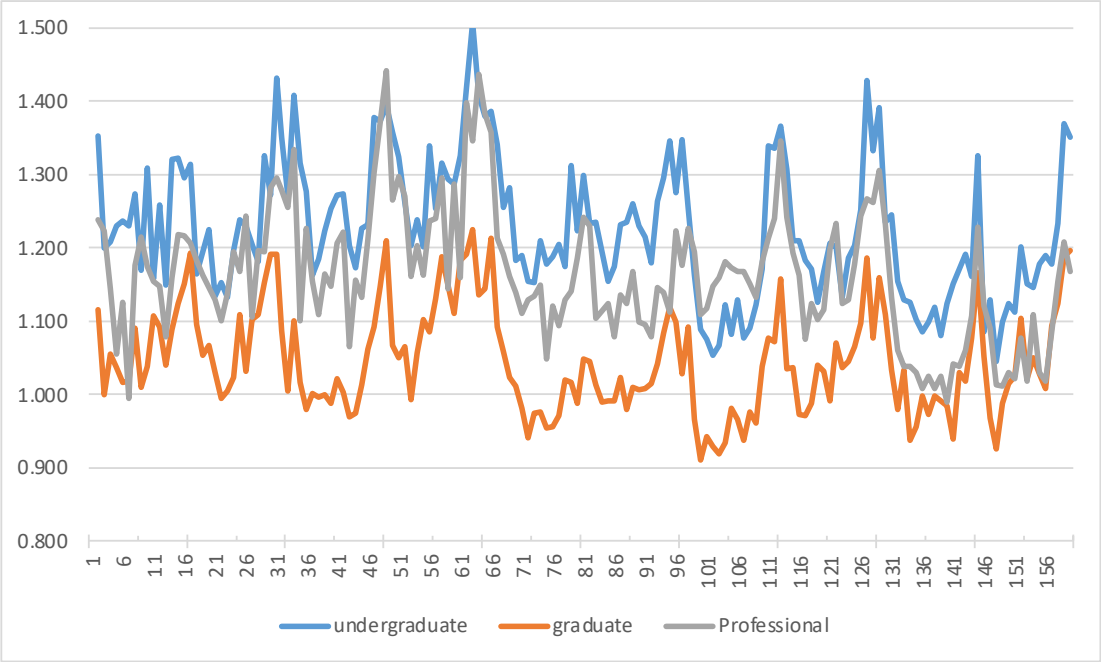


Figure 2a.

Mean Note Onset Times for Phrases A, A[1], and B for the Three Selected Performances.

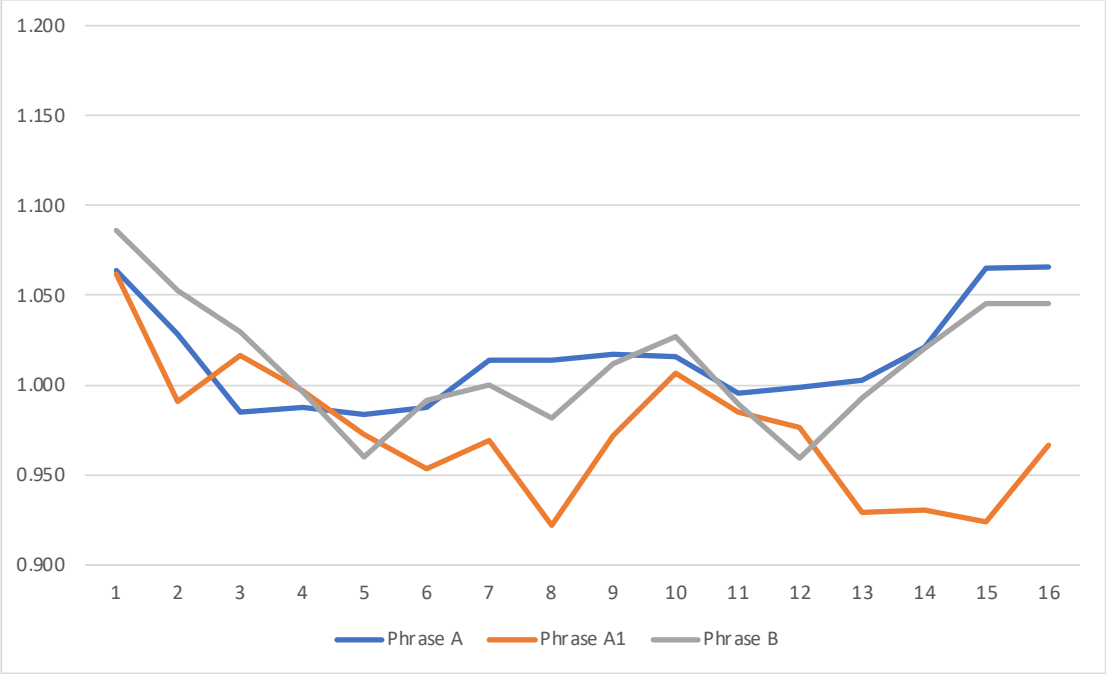
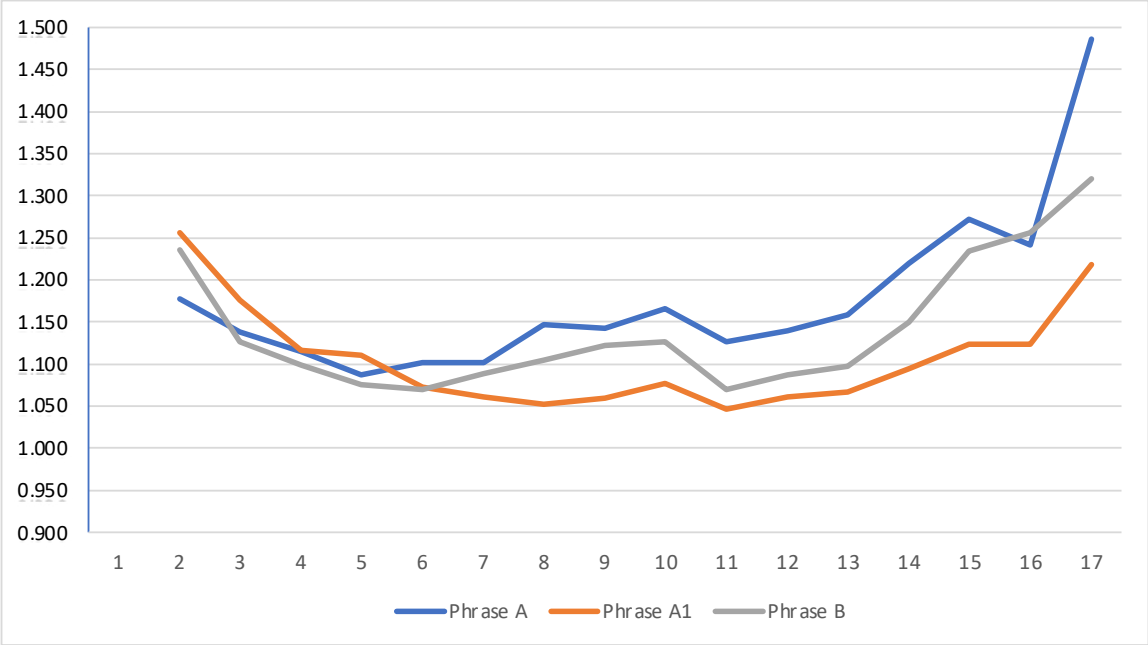


Figure 2b.

Mean Note Onset Times for Phrases A, A[1], and B for the Previously Examined Conductor Performances



EFFECTS OF IMPLIED CONDUCTOR AGE AND GENDER ON ENSEMBLE PERFORMANCE EVALUATIONS

Ann M. Harrington & Gregory Springer

Throughout their careers, adult musicians progress through multiple age categories, entering the profession as young or middle-aged adults and continuing to work through older adulthood, often beyond the traditional retirement age of 65 years old (Manturzewska, 1990). For example, Rochlitz (1993) noted that conductors such as Leopold Stokowski, Pablo Casals, David Mannes, Nadia Boulanger, and Pierre Monteaux continued their careers beyond the age of 80. In recent years, professional conductors as young as 26 have led performances with the New York Philharmonic (Barone, 2022), while colleagues in their 90s were continuing conducting careers with other professional orchestras (Gereben, 2023).

A conductor's age may contribute to how they are perceived by others. At a glance, humans automatically categorize others along three primary interpersonal dimensions: age, race, and gender (Nelson, 2005). Of these, age is unique in that all individuals may occupy multiple age-based categories throughout their lives (North & Fisk, 2012). An individual's appearance can imply that they belong to a particular age category (e.g., young adult, middle-aged, older adult), which may be related to assumptions made about their abilities. Previous research has shown that these assumptions may be due to certain age-based stereotypes (Hummert et al., 1997), which may influence beliefs about an individual's cognitive abilities (Kite et al., 2005), work ethic (Finkelstein et al., 2013), potential for professional advancement (Marchiondo et al., 2016), and the quality of their work (Chasteen et al., 2021). Although a considerable portion of age-based research has focused solely on experiences of older adults, recent investigations have shown that age-based stereotypes negatively impact the professional lives of younger and older adults at similar rates (Marchiondo et al., 2016). Because the role of the conductor is filled by individuals of a wide variety of ages and because all living conductors may progress through multiple age categories over time, the potential for conductor age to influence perceptions of their professional work seems especially relevant.

Review of Literature

The Influence of Visual Factors on Performer and Conductor Evaluations

Although listeners tend to believe that their impressions of music performances are predominantly influenced by sound, previous research has demonstrated the salience of visual information in these evaluations (Mitchell & Macdonald, 2016). For example, listeners' perceptions of music performances may be influenced by a performer's attire (Griffiths, 2008; Urbaniak & Mitchell, 2022), attractiveness (Wapnick et al., 2009), race (Elliott, 1995; McCrary,

1993), and gender (Behne & Wöllner, 2011; Moloney & Mitchell, 2023). Visually implied age may also influence performance evaluations, as (Harrington) (2016) found that listeners rated soloists' performances higher when audio performances were paired with a photograph of an older adult compared to a photograph of a younger adult or an audio-only presentation.

Behaviors demonstrated by ensemble conductors may also influence listeners' evaluations of musical performances, and those influential behaviors may be enacted before, during, and after musical performances. Previous findings indicate that positive pre-conducting behaviors (approaching the podium, setting down score and baton, adjusting stand, and picking up baton) resulted in higher perceptions of conductor competence compared to negative pre-conducting behaviors (Cumberledge et al., 2021; Fredrickson et al., 1998). Positive conductor behaviors demonstrated immediately after a performance (a full bow, engaged facial expressions, posture, and confident stride) also resulted in higher ratings of ensemble performance and conductor competence (Warnet, 2026). Silvey (2013) found that a conductor's facial expression influenced listeners' ratings of ensemble expressivity such that approving facial expressions resulted in significantly higher expressivity ratings than neutral or disapproving facial expressions. Researchers also found that listeners' perceptions of ensemble performances differed based on whether a conductor used a baton (Silvey et al., 2017), a high, medium, or low conducting plane (Silvey & Fisher, 2015), and a musical score (Springer et al., 2024). Together, these findings highlight that various conductor behaviors seem to play a role not only in observers' perceptions of conductors but also in their perceptions of musical performances led by those conductors.

Beyond the gestures and overt behaviors of conductors (Morrison et al., 2009, 2014; Morrison & Selvey, 2014; Price & Mann, 2011; Price et al., 2016), researchers found that certain aspects of a conductor's appearance may influence ensemble performance ratings. For instance, VanWeelden (2004) found that listeners rated a spiritual performance significantly higher when conducted by Black conductors compared to White conductors. In a follow-up study, VanWeelden and McGee (2007) found that listeners rated performances of Western art music significantly higher when conducted by White conductors, and they rated identical performances of spirituals higher when conducted by Black conductors. VanWeelden (2002) also found that listeners' ensemble performance ratings did not vary as a function of conductor body type (larger build vs. thinner build), but that ensemble performance ratings were related to the conductor's posture and facial expressions.

A conductor's appearance may also imply their gender, which may influence how they and their ensembles are perceived.[1] Accounts from female conductors, spanning the early 20th century to the present, suggest that gender-specific challenges have shaped their professional experiences (Hamer, 2019; Shouldice, 2023), including their perceptions of music performance evaluations (Bovin, 2019). Historically, the majority of European and North American

1 Although current discussions conceptualize gender as a spectrum rather than two binary categories (Duignan, 2023), researchers have found that some conductors have been adversely affected by binary gender stereotypes (Bovin, 2019; Sears, 2014; Shouldice, 2023).

conductors have been male, particularly in instrumental settings (Griswold & Chroback, 1991; Hamer, 2019). Although the number of female-identifying band directors has increased in recent years, they make up only 10% to 25% of high school band directors in the United States (Shouldice & Eastridge, 2020; Shouldice & Woolnough, 2022). This imbalance has been associated with professional difficulties for female and female-presenting band directors (Shouldice, 2023), which may begin during hiring practices. Bovin (2019) reported that female band directors had been hired to work with smaller or less successful programs and believed administrators did not take them seriously. Those hired to lead more prestigious programs reported being mistaken for an assistant director working under a male colleague. Additionally, female band directors felt isolated or treated differently by peers, perceived that their bands were evaluated less favorably (Sears, 2014), and experienced gender-related microaggressions, such as lack of recognition, restrictive gender roles, and assumptions of inferiority (Shouldice, 2023). These issues were particularly challenging for younger women, underscoring the potential interconnection between perceptions of age and gender (Sears, 2014; Shouldice, 2023).

Previous research has also documented the effects of conductor gender on formal music performance evaluations. Shouldice and Eastridge (2020) investigated assessment ratings assigned to 3,229 concert band performances in the state of Virginia and found that male-led ensembles were more likely to receive a I (the most favorable performance rating) than female-led ensembles. However, results of a subsequent study indicated that conductor gender was not a significant predictor of ensemble ratings when repertoire difficulty was considered (Shouldice & Woolnough, 2022). Female conductors tended to choose less challenging pieces, which was linked to lower performance ratings —a finding consistent with a previous study, in which less difficult repertoire was associated with lower concert band performance ratings (Silveira & Silvey, 2020). When considered together, these findings suggest relatively complex relationships between conductor gender, repertoire, and music performance evaluations.

Need for the Study

Although previous research has shown that listeners' evaluations of musical performances may be influenced by aspects of a conductor's appearance, such as race (VanWeelden, 2004; VanWeelden & McGee, 2007) and gender (Behne & Wöllner, 2011; Elliott, 1995), we were surprised to find no research examining the effects of the primary interpersonal dimension of age. Like race and gender, age is a visually implied fundamental component of social perception (Nelson, 2005), and different categories of each component are associated with certain stereotypes (Hummert et al., 1997). Age-based stereotypes may contribute to perceptions of an individual's competence (Kite et al., 2005), the quality of their work (Chasteen et al., 2021), and evaluations of job performance (Bal et al., 2021). How age-related visual information might sway listeners' performance ratings offers substantial implications for conductors regarding a potential perceptual bias in musical performance. Therefore, it is important to examine the consequences of such age-related stereotyping of conductors. Because previous research has shown some connections between conductor gender, professional experiences, and ensemble

ratings, it is also important to examine how the consequences of age-related stereotyping might differ between male and female conductors.

More broadly, ensemble performances involve a complex interaction of aural and visual stimuli, and there is evidence that visual information can influence auditory perception of music performances (Platz & Kopiez, 2012). By examining how visual information associated with conductor age may affect perceptions of music performances, researchers may gain a greater understanding of how listeners' perceptual or cognitive evaluation of sound may be influenced by visual information (Schutz, 2008). As such, the purpose of this study was to examine the effects of visually implied conductor age and gender on ensemble performance evaluations. We asked the following research questions: (1) What are the effects of implied conductor age (implied young adult, middle-aged adult, older adult, or no implied age [control]) on ratings of ensemble accuracy and expressivity? (2) Are the effects of implied conductor age consistent for men and women? (3) What are the effects of implied conductor age and gender on perceptions of a conductor's effectiveness as measured by an improvement capacity rating?

Method

Participants

We conducted a power analysis using *G*Power* software, version 3.1.9.3 (Faul et al., 2007), to determine an appropriate sample size for a multivariate analysis of variance (MANOVA) with a within-between interaction. Results of the analysis suggested a minimum sample size of 95 (input parameters included an alpha level of .05, a power level of .80, and a projected effect size *f* of .30). After obtaining approval from the Institutional Review Board (IRB) we recruited undergraduate music majors from three institutions located in the southern (n = 1) and midwestern (n = 2) United States. These institutions included comprehensive schools of music that were NASM-accredited and offered degrees in music education. Study participants (N = 104) were recruited through spoken announcements made in university ensembles and music classes. Self-reported demographic information indicated participants' gender[2] (male, n = 57; female, n = 47; non-binary, n = 0), age (M = 19.71 years, SD = 1.60, range 18 to 29 years), and primary instrument (woodwind, n = 33; brass, n = 26; percussion, n = 5; strings, n = 6; keyboard, n = 2; voice, n = 32).

Preparation of Visual and Audio Stimuli

Hummert et al. (1997) and Harrington (2016) demonstrated that viewing still photos (headshots) of adults activated observers' age-related assumptions. Following those examples, we paired an audio recording of a concert band performance with different headshots. We began preparing the visual stimuli by selecting headshots of adults from over 500 similar

2 Participants indicated their gender using a Ţll-in-the-blank item in which they could use their own words.

images available through Shutterstock, Inc. To control for visual characteristics associated with race (which have been explored in previous conductor studies—cf., VanWeelden, 2004; VanWeelden & McGee, 2007), we included headshots featuring male and female White models. All selected images featured smiling adults posed in front of a plain, light-colored background. After selecting 40 headshots that met these criteria, we recruited a sample of 54 undergraduate students and asked them to label the gender of each adult, indicate which age category (young adult/middle-aged adult/older adult) best represented each adult, and estimate the chronological age (in years) of the adult in each image. Because researchers have previously reported that performer attractiveness influenced performance evaluations (Wapnick et al., 2009), we also asked participants to indicate whether they found the person featured in the image to be "better than average looking," "average looking," or "less than average looking." These individuals did not participate in any other part of the study.

We used an iterative process to select images for the visual stimuli in this study. First, we examined the judges' responses and identified images that were labeled as male or female with 100% agreement. The age category that was selected by the highest percentage of judges was also identified and used to label each image as younger adult (YA), middle-aged adult (MA), or older adult (OA). We removed images with less than 90% agreement and those not rated as "average looking" by at least 90% of the judges. Using the estimated ages provided by the judges, we computed the mean age for each image. We selected the male and female images in each category (YA, MA, and OA) that had the most similar mean age estimates (male: YA = 25.74, MA = 48.01, OA = 72.56; female: YA = 24.22, MA = 46.49, OA = 74.88). The resulting stimuli featured six images, with one male and one female image for each age category.

To prepare audio stimuli, we chose an excerpt from the first movement ("Seventeen Come Sunday") of *English Folk Song Suite* by Ralph Vaughan Williams because it was part of the standard repertoire for concert bands as evidenced by its inclusion in lists of recommended literature (Kreines, 1989; Miles, 1997). We then selected a live recording of the piece performed by a university concert band that was of high quality and included no artifacts of live performance that would be noticed while listening to repeated trials (e.g., obvious performance error or audience coughing). Using *Audacity*, we extracted the first 60 seconds of the movement and inserted a three-second fade-out at the end of the excerpt. We exported the audio stimulus as a .wav file with 44.1 kHz sampling rate (16-bit depth). Audio-visual stimuli were then created by pairing the musical excerpt with each of the selected images using Microsoft PowerPoint. These pairings allowed us to present the same musical excerpt with each combination of implied conductor age and gender, and the images functioned like headshots of conductors that would be visible in concert programs or in the liner notes accompanying a recorded album. We also included an audio-only (AO) condition without visual stimuli to serve as a control condition.

We then conducted a pilot study with ($N = 21$) undergraduate music majors to test research procedures. We found 100% agreement between the judges and pilot study participants' labeling of images by implied age category and gender, and retained the stimuli for use in the

full study. Individuals who took part in the pilot study did not participate in any other part of the research procedures.

Design and Procedure

We designed the current study in a mixed factorial design with implied conductor age (YA, MA, OA, or no implied age [audio-only control]) as a within-subjects factor and implied conductor gender (male or female) as a between-subjects factor. Participants were randomly assigned to an implied conductor gender condition *a priori*. Within each group, participants experienced the musical excerpts with all implied age conditions in one of three presentation orders (Order 1: AO, YA, MA, OA; Order 2: AO, OA, MA, YA; Order 3: AO, MA, OA, YA). Participants rated the accuracy and expressivity of each excerpt using 10-point scales anchored by 1 (*very poor quality*) and *10* (*highest quality*). Similar to Harrington (2016), we also asked participants to respond to an improvement capacity question ("How much musical improvement do you think that this conductor could help their ensemble to make over the next year?") using a rating scale anchored by 1 (*little or no improvement*) and 10 (*considerable improvement*). That question was followed by the prompt: "In the space below, use two or three sentences to describe the reasons for your decision." To discourage visual stimuli from influencing participants' ratings of performances that did not include a visual component (no implied age or implied gender), participants rated the AO presentation before the AV presentations. After completing all other portions of the procedures, participants viewed one slide that displayed the images of the three conductors. To ensure that the visual conditions functioned as intended among our sample, participants then used a free-response item to label the gender of each adult and indicated which age category (young adult/middle-aged adult/older adult) best represented each adult. We found 100% agreement between the judges and participants' labeling of images by implied age category and gender.

To begin the research procedures, we read the following instructions aloud for the AO example:

> The purpose of this study is to investigate how people decide what is a good musical performance and what is not. Listen to the musical performance. You will be asked to rate its accuracy and expressivity. Please do not talk or share your responses with others.

As in previous research (Springer and Schlegel, 2016), we provided descriptions of accuracy ("the degree to which the ensemble performed with accuracy and precision") and expressivity ("the degree to which the ensemble performed with musicianship and expressiveness") to encourage a consistent interpretation of these terms. We then played the musical excerpt while a blank screen was projected. After participants rated the first performance (AO), we projected the first image on a large screen, and we read the following instructions aloud for the remaining AV examples: "During the remaining performances, please look at the picture of the ensemble conductor while you listen to each performance." Participants repeated the same procedures for the remaining excerpts (YA, MA, and OA).

Results

For our primary data analysis, we used a multivariate analysis of variance (MANOVA) because we believed our two dependent variables (accuracy ratings and expressivity ratings) represented related outcomes (Huberty & Morris, 1989) and because we conceptualized these two variables as a linear composite (Meyers et al., 2017). However, before conducting data analyses, we screened the data to determine whether they met the assumptions of MANOVAs. During data screening, we identified two univariate outliers whose ratings deviated from the mean by more than 3 standard deviations. Given the sensitivity of MANOVAs to outliers, we removed those two cases from the dataset, which reduced our sample size from 106 (initial data collection) to 104 (the final sample size reported in this study). After the removal of outliers, a visual inspection of histograms and normal Q-Q plots suggested univariate normality, and univariate skewness and kurtosis statistics were between -1.0 and 1.0. There were no significant Mahalanobis distances ($p > .05$), indicating no multivariate outliers. Examination of scatterplots suggested linear relationships between dependent variables, and correlations between dependent variables were less than the threshold of .70 (Meyers et al., 2017), indicating the absence of multicollinearity. Results of Box's test indicated that the assumption of homogeneity of variance-covariance matrices was not met, $M = 283.52$, $p = .02$. Therefore, we reported Pillai's trace as the multivariate test statistic because it is more robust to homogeneity violations than other test statistics (Meyers et al., 2017).

Accuracy and Expressivity Ratings

To examine the effects of implied conductor age and gender on performance ratings, we conducted a mixed-design MANOVA using conductor gender as a between-subjects factor and implied conductor age condition (AO, YA, MA, or OA) as a within-subjects factor. We also included presentation order as a between-subjects factor to test for possible order effects. Dependent variables were participants' ratings of accuracy and expressivity. Results indicated significant multivariate main effects for condition, Pillai = .29, $F(6, 93) = 6.32$, $p < .001$, $h^2_p = .29$, as well as presentation order, Pillai = .14, $F(4, 196) = 3.54$, $p = .01$, $h^2_p = .07$. There were no other significant main effects or interaction effects, as summarized in the MANOVA source table (see Table 1). Descriptive statistics are provided in Table 2.

Results of Bonferroni-corrected univariate ANOVAs indicated that the main effect of implied conductor age condition was significant for participants' ratings of expressivity[3], $F(2.73, 267.87) = 8.02$, $p < .001$, $h^2_p = .08$, but not for accuracy, $F(3, 294) = 1.90$, $p = .13$, $h^2_p = .02$. Bonferroni-adjusted pairwise comparisons indicated significant differences between expressivity ratings between the AO and MA conditions ($p < .001$), between AO and OA conditions ($p = .008$), between YA and MA conditions ($p = .006$), and between YA and OA conditions ($p = .025$). Effects of implied conductor age on expressivity ratings are illustrated visually in Figure 1.

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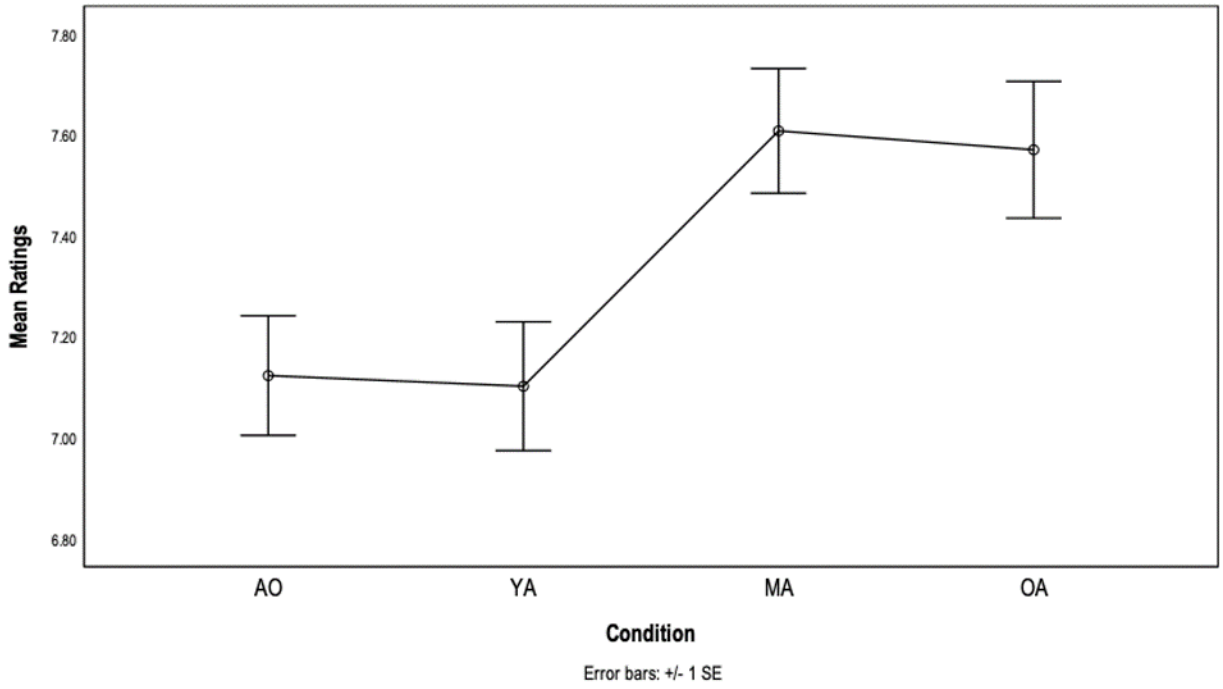
3 Mauchly's test indicated a violation of the sphericity assumption for the expressivity variable, $W = .85$, $\chi^2(5) = 15.61$, $p = .008$. Therefore, we applied a Greenhouse-Geisser correction to the degrees of freedom for the within-subjects effects associated with expressivity. There were no other sphericity violations.

Figure 1

Profile Plot: Effects of Implied Conductor Age on Expressivity Ratings

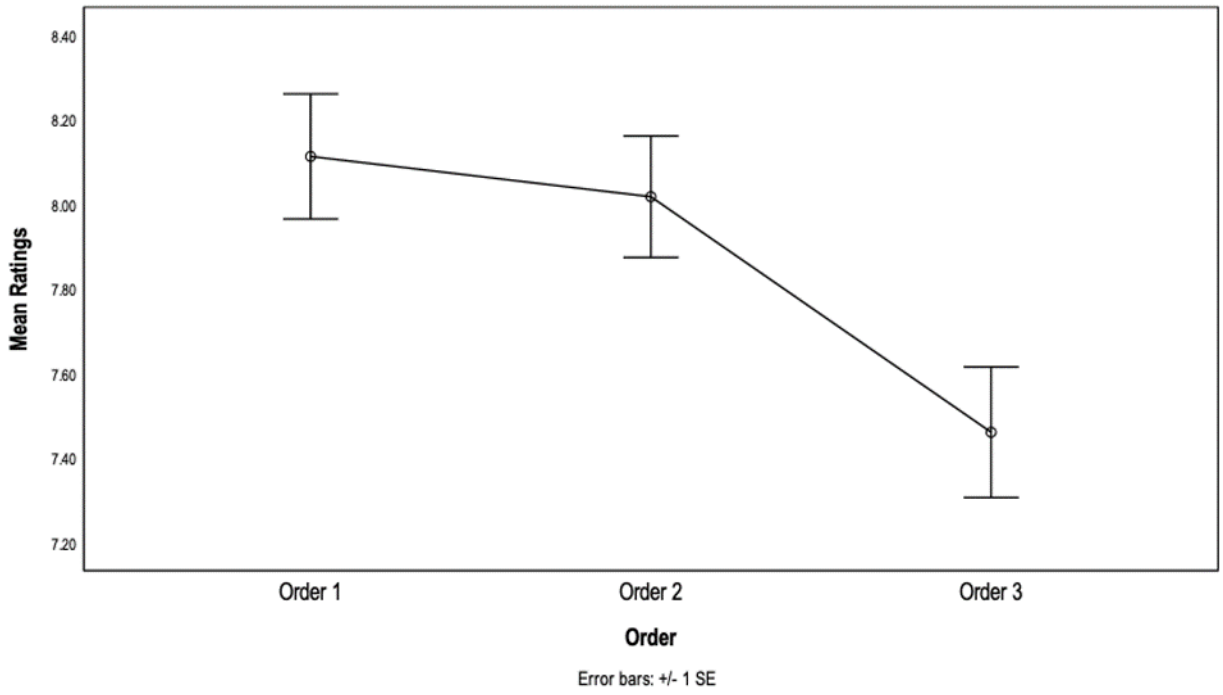


Note. Conditions are labeled as AO (audio only), YA (younger adult), MA (middle-aged adult), and OA (older adult).

In contrast, results indicated that presentation significantly influenced participants' accuracy ratings, $F(2, 98) = 5.38$, $p = .006$, $h^2_p = .10$, but not expressivity ratings, $F(2, 98) = .03$, $p = .97$, $h^2_p < .01$. Bonferroni-adjusted pairwise comparisons indicated significant differences between Order 1 and Order 3 ($p = .01$) and between Order 2 and Order 3 ($p = .02$). The main effect of order is displayed in Figure 2.

Figure 2

Profile Plot: Effects of Presentation Order on Accuracy Ratings



Note. Orders are labeled as Order 1 (AO, YA, MA, OA), Order 2 (AO, OA, MA, YA), and Order 3 (AO, MA, OA, YA)

Improvement Capacity Ratings

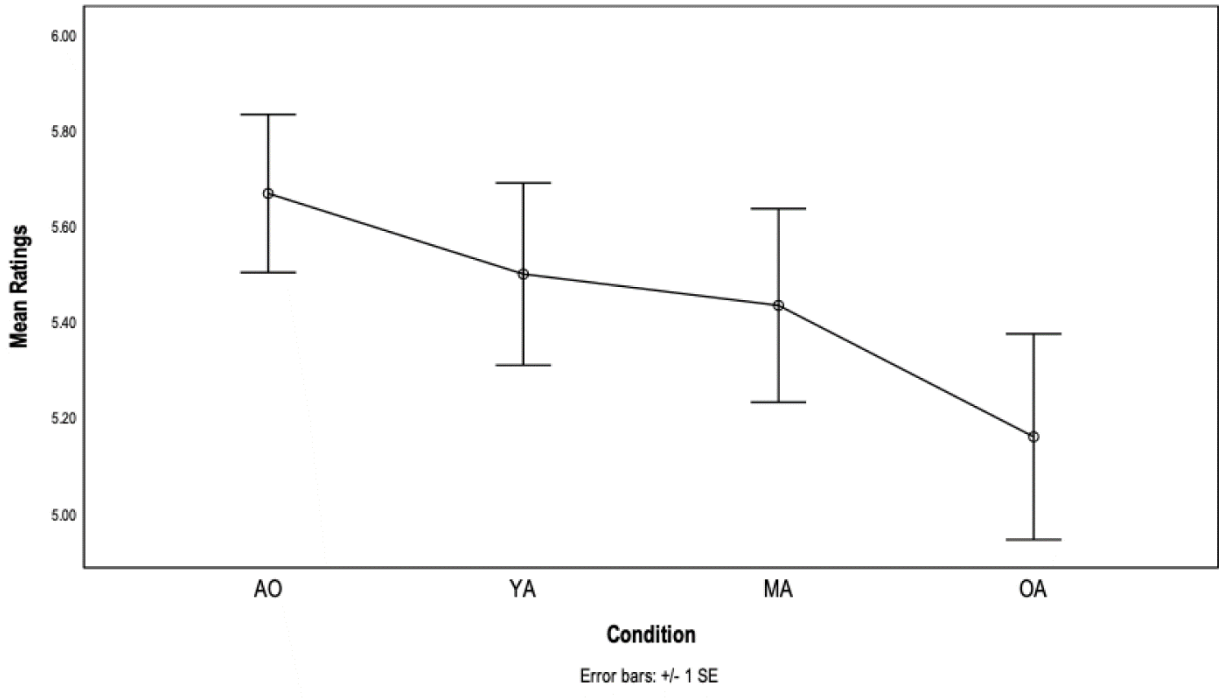
We also conducted a mixed-design ANOVA to determine the effects of implied conductor age, gender, and order on improvement capacity ratings. For this analysis, we included two between-subjects factors (conductor gender and order) and one within-subjects factor (implied conductor age condition). The dependent variable was participants' improvement capacity rating. Results indicated significant main effects for implied conductor age condition, $F(3, 291) = 3.79$, $p = .01$, $h^2_p = .04$, and presentation order, $F(2, 97) = 3.29$, $p = .04$, $h^2_p = .06$. There were no other significant main effects or interaction effects. Complete ANOVA results are summarized in Table 3.

Regarding implied conductor age condition, follow-up pairwise comparisons (with Bonferroni adjustment for multiple comparisons) indicated a significant difference between AO and OA conditions ($p = .02$). Participants provided highest ICI ratings in the AO condition ($M = 5.66$,

SD = 1.70), followed by YA (*M* = 5.49, *SD* = 1.94), MA (*M* = 5.43, *SD* = 2.08), and OA (*M* = 5.16, *SD* = 2.19). We also conducted Bonferroni-adjusted pairwise comparisons to determine the source of the significant order effect. Significant differences were found between Order 1 and Order 2 only (*p* = .04). Participants provided the highest ratings in Order 1 (*M* = 5.90, *SD* = 1.89), followed by Order 3 (*M* = 5.55, *SD* = 1.66) and Order 2 (*M* = 4.87, *SD* = 1.56). Effects of implied conductor age on improvement capacity ratings are illustrated visually in Figure 3.

Figure 3

Profile Plot: Effects of Implied Conductor Age on Improvement Capacity Index



Note. Conditions are labeled as AO (audio only), YA (younger adult), MA (middle-aged adult), and OA (older adult).

Free Response Data

To analyze the free-response data, we transcribed participants' written responses, identified distinct comments within longer responses, and coded each comment as *positive*, *negative*, or *neutral*, consistent with Harrington (2016). A doctoral student in instrumental music education who was unconnected with the study also coded the responses independently to determine intercoder reliability, the results of which indicated an agreement ratio of 0.92. We then created

a frequency distribution table and computed percentages of positive, negative, and neutral comments for each implied age and gender condition. Most participants explained their rationales by commenting on the musical performances, providing more comments for some performances and fewer comments for others. Therefore, relative frequency distributions were computed for each implied age and gender condition and recorded along with percentages.

Of the 450 comments, 188 (42%) were positive, 236 (52%) were negative, and 26 (6%) were neutral. Participants made positive comments most frequently in the MA condition (n = 56, 50%) and least frequently in the YA condition (n = 45, 35%). Conversely, participants made negative comments most frequently in the YA condition (n = 75, 59%), and least frequently in the MA condition (n = 52, 47%). Participants who viewed male images made positive comments more frequently (n = 105, 43%) than those who viewed female images (n = 83, 40%). However, participants made negative comments in the male (n = 127, 52.70%) and female conditions (n = 127, 52%) at similar rates. Across all combinations of the implied age and gender conditions, participants made positive comments most frequently when viewing a MA male image (n = 32, 55%) and least frequently when viewing a YA female image (n = 19, 32%). Participants made negative comments most frequently in response to the YA female image (n = 36, 60%) and least frequently in response to the MA male image (n = 28, 44%). Complete frequency distributions of positive, negative, and neutral comments are provided in Table 4. Additionally, we noted that a small number of statements (n = 10, 2%) included references to the ages of the YA and OA conductors. These negatively worded comments included perceptions of the YA conductors' inexperience and OA conductors' potential lack of vitality.

Discussion

In this study, we examined how visually implied conductor age and gender influenced listeners' evaluations of a concert band performance. Results indicated that participants rated performances differently when viewing conductors who appeared to belong to different age groups, and the effect size was large (h^2_p = .29; Cohen, 1988). Specifically, participants assigned significantly higher expressivity ratings to performances attributed to MA and OA conductors and lower expressivity ratings to performances attributed to YA conductors and AO presentations. Furthermore, most performances attributed to YA conductors were rated lower than AO presentations. These results suggest that, when receiving performance evaluations, conductors who appear to be younger adults may be at an age-related disadvantage. We note that the observed effects in this study were simply a result of viewing a headshot of people from different age groups while listening to identical audio recordings; the visual characteristics from still photographs alone were enough to generate differences in performance ratings. Therefore, visual characteristics associated with age seemed to prime our participants in a way that affected their perceptions of both the ensemble and the conductor.

These findings are also somewhat consistent with previous research in which younger workers experienced age-related mistreatment more frequently than middle-aged workers. However, previous workplace research reported that younger and older workers experienced age-related mistreatment at similar rates (Chasteen et al., 2021; Finkelstein et al., 2013; Marchiondo

et al., 2016). The findings of the present study do not align with the predominantly negative attitudes toward older adults reported in other professional settings (Bal et al., 2011; Kite et al., 2005) but are consistent with the favorable ratings of OA soloists found in an earlier study (Harrington, 2016). The more favorable attitude towards older adults observed in the present study may be related to the visibility of notable conductors who continued working through middle age and older adulthood (Manturzewska, 1990).

Participants' comments further indicated that they were influenced by viewing conductors of different age categories. Specifically, participants made positive statements most frequently when commenting on performances attributed to MA conductors and least frequently when commenting on performances attributed to YA conductors. Conversely, participants made negative statements most frequently when commenting on performances attributed to YA conductors and least frequently when commenting on performances attributed to MA conductors. These findings suggest that participants were more inclined to praise performances associated with MA conductors and criticize performances associated with YA conductors, even though the audio recording was identical across conditions. However, expertise cannot solely be determined by age or years of experience (Standley & Madsen, 1991). Future explorations of relationships between assumptions regarding age, gender, experience, and expertise may help develop further insights into how listeners' preconceived notions of conductors may influence perceptions of music performances.

The more favorable perceptions of performances attributed to MA conductors are similar to findings from workplace research, in which middle-aged adults reported experiencing the least amount of age-related bias (Chasteen et al., 2021; Marchiondo et al., 2016). Regarding the strength of that observed trend, Finkelstein et al. (2013) suggested that middle-aged employees may represent the "idealized worker about whom expectations are consistently quite positive… [and] represent the idealized standard against which other age groups are judged" (p. 21). Participants' tendency to provide the highest performance ratings, the most praise, and the least criticism when viewing middle-aged individuals suggests that middle-aged conductors may be held in similar esteem.

Although visually implied conductor age influenced expressivity ratings, accuracy ratings did not differ significantly across implied age or gender conditions. This finding is consistent with previous studies in which visual factors, specifically post-conducting behaviors, influenced expressivity and overall performance quality, but accuracy ratings remained relatively consistent across visual conditions (Warnet, 2026). It is possible that evaluations of a more technical dimension of performances (accuracy) may be somewhat less subjective than evaluations of expressivity and, therefore, less susceptible to extra-musical influences.

With regard to the observed order effect for accuracy ratings, the mean rating of Order 3 was significantly lower than that of Order 1 and Order 2. In Order 3, all levels of the implied age condition were rated lower than corresponding levels in other orders, suggesting an anchoring effect. Each participant made initial evaluations when they rated the AO condition, and that rating served as a reference point from which they made subsequent evaluations for the conditions

that followed. When initial evaluations are dissimilar from one another, subsequent evaluations are likely to be influenced by those respective reference points and remain dissimilar (Tversky & Kahneman, 1974). Because the initial reference point of Order 3 ratings was lower than the other orders, ratings of subsequent Order 3 conditions remained lower than those of other orders, contributing to a significantly lower mean rating for Order 3.

Participants' ratings did not differ significantly as a function of conductor gender, which aligns with previous research concerning festival ratings awarded to female band directors. Shouldice and Woolnough (2022) reported that when factors such as repertoire selection were considered, conductor gender was not a significant predictor of festival ratings. Although participants in our study rated a single identical performance in all conditions rather than multiple pieces in a live adjudication setting, the study design standardized the musical aspects of the performance. The lack of significantly different ratings in this controlled setting further suggests the importance of repertoire selection in evaluations of musical performances. Although ratings did not significantly differ by conductor gender, it is interesting to note that participants consistently assigned lower ratings to performances attributed to female conductors in nearly every condition (see Table 2). Performances attributed to female conductors received lower accuracy ratings in all AV conditions (YA, MA, OA), and lower expressivity ratings in two AV conditions (MA and OA). This rating pattern may represent a subtle influence of implied conductor gender on the performance evaluations.

Our analysis of open-response data revealed that participants' use of positive and negative comments differed when viewing male and female conductors. In all conditions where a conductor photo was visible, participants made positive statements more frequently when commenting on performances attributed to male conductors and less frequently when commenting on performances attributed to female conductors. Although participants were not inclined to be overly critical of performances attributed to female conductors, they were less inclined to praise those performances. This tendency may be related to the historical underrepresentation of women as instrumental conductors and associations of the conductor role with masculinity (Griswald & Chroback, 1991; Shouldice, 2023). It is also possible that a tendency to withhold praise may be related to microaggressions, such as a lack of recognition and comparatively limited professional opportunities extended to female band directors (Shouldice, 2023).

Regarding improvement capacity ratings, participants assigned the highest improvement capacity ratings during AO presentations and the lowest improvement capacity ratings when viewing OA conductors. In their rationale statements, several participants associated the lower-rated performances (AO and YA conditions) with "room to grow," which could allow for more remarkable improvement, expressed as higher improvement capacity ratings. Additionally, the AO condition was rated before all AV conditions and, therefore, was not influenced by the images of a YA conductor and the associated "inexperience" mentioned by some participants. The combination of room for growth and the lack of age-related assumptions may account for the comparatively high improvement capacity ratings assigned to the AO condition.

Although participants assigned comparatively high ratings to performances attributed to OA conductors, this favorable perception did not coincide with similarly high ratings of OA's capacity to help their ensembles improve. The results showed that OA conductors received the lowest improvement capacity rating. Because performances attributed to OA conductors were rated more favorably, they may not have been associated with the same room for growth. It is also possible that the participants held less favorable views of the OA conductors' ability to help their ensembles advance beyond their current performance quality level, which is consistent with findings reported by Harrington (2016) and aligns with research on age-related bias (Bal et al., 2011). Participants may have been influenced by unconscious age-related stereotypes, such as lower interpersonal skills and competency levels (Kite et al., 2005), which could contribute to the belief that older conductors would be less likely to help their ensembles improve. Although results showed a significant order effect for improvement capacity ratings, participants in all order conditions assigned the highest rating to the AO condition, followed by YA conductors, MA conductors, and then OA conductors. Therefore, results related to the implied age condition may still be useful when considering the influence of conductor age on perceptions of improvement capacity.

Limitations

We acknowledge certain limitations of this study, which should be considered when interpreting findings. In this study, we used one excerpt of concert band music performed by a university ensemble as the audio stimulus. It is possible that different results would be found if different musical genres (e.g., a lyrical selection), performance levels (e.g., middle school ensemble), or performance contexts (e.g., SATB choral ensemble) were used. Additionally, observers in this study were younger adults between the ages of 18 and 29. Thus, the results of this study reflect perceptions of implied age from the perspective of younger adults. We are curious about how observers of different ages might rate performances differently as a function of implied conductor age, especially whether middle-aged observers would express comparatively critical views similar to findings reported in workplace literature (Finkelstein et al., 2013). Future research could also examine the nature of feedback (positive, negative, or neutral) provided by different age groups to further probe possible intersections of conductor and observer age.

Finally, consistent with previous research in music performance evaluation (Harrington, 2016) and prior studies of age-related perception (Hummert et al, 1997), we used headshot photographs to represent the implied age and gender conditions in this study. Thus, participants viewed headshots similar to what they would view in concert programs and liner notes accompanying audio recordings. The use of still photos—rather than video recordings—was important to isolate the variables of interest because idiosyncratic differences in conducting gestures between conductors would have likely influenced the results of the study, as evidenced by prior research (Morrison et al., 2009, 2014; Morrison & Selvey, 2014; Price & Mann, 2011; Price et al., 2016). However, this aspect limited the external validity of the findings. Future studies exploring perceptions of conductors using naturalistic video recordings will help extend these findings.

Implications

Evaluations of the quality of musical performances are a common component of music listening (Thompson & Williamon, 2003). As such, the results of this study offer implications for practice. Most notably, appearing to be a young adult may disadvantage conductors during performance evaluations. Awareness of age-related stereotypes may inform younger conductors' efforts to respond to feedback provided in formal and informal evaluations. Additionally, participants' responses implied that they associated greater chronological age with increased conducting experience and, by extension, expertise, which may account for the more favorable ratings of performances associated with MA and OA conductors. Building on Finkelstein's (2013) statements describing MA employees as an "idealized standard" (p.21), the idealized image of a conductor may align more readily with individuals who are not only male (Hamer, 2019), but also those who appear old enough to have accumulated a substantial amount of experience.

Although results of this study indicated that conductors who appear younger may be at a disadvantage in terms of performance ratings, conductors who appear older seem to be at a disadvantage regarding perceptions of improvement capacity. Consistent with previous research, which found that older adult soloists were perceived as less capable of improvement than younger adults (Harrington, 2016), our current findings suggest that the younger adult participants may perceive older adults as less capable of leading ensembles in ways that will improve the quality of future performances. When considered with prior literature on perceptions of older adults' cognitive abilities (Kite et al., 2005), work ethic (Finkelstein et al., 2013), and job performance (Bal et al., 2011), this result suggests that some negative stereotypes regarding older adults as conductors may exist.

We found no significant differences in performance ratings or improvement capacity as a function of implied conductor gender. However, our descriptive results indicated that participants rated performances paired with female headshots lower than those paired with male headshots on most evaluation criteria. Similarly, participants were more likely to provide positive comments in response to performances attributed to male conductors. Considering the microaggression experiences described in Shouldice (2023), a fuller understanding of the intersection of assumptions related to gender and the role of the conductor is needed. Conductors working in professional, community, and educational settings represent varied genders and a wide range of ages, from young adults to older adults. Any cognitive biases that affect one's perceptions of any gender or age group should be considered problematic. Efforts to examine and mitigate these biases are important, especially to the extent that they may impact listeners' perceptions of conductors and the quality of the musical performances they lead.

Suggestions for Future Inquiry

Given the effects of implied conductor age and gender on evaluations of ensemble performance observed in this study, researchers should continue to investigate how these variables affect perceptions of conductors and their ensembles. In particular, a future study incorporating different performance levels (university, high school, middle school ensembles) and musical genres

(march, ballad, overtures) could illustrate how participants' perceptions might vary in these different performance contexts. Similar studies conducted in live performance settings could also offer insights into the potential effects of the primary interpersonal dimensions of race, age, and gender on evaluations of musical performances. Furthermore, a study of feedback given to conductors at formal performance evaluations would allow for a more detailed comparison of comments provided to male and female conductors and conductors of different age groups. Additional studies in this and related lines of inquiry will help further identify cognitive biases that may influence observers' perceptions of conductors and the musical performances they lead.

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Table 1

MANOVA Source Table for Accuracy and Expressivity Ratings

Source	Pillai	*F*	*df*	*p*	η^2_p
Between-Subjects Effects					
Gender	.04	2.22	(2, 97)	.11	.04
Order*	.14	3.54	(4, 196)	.01	.07
Gender x Order	.07	1.72	(4, 196)	.15	.03
Within-Subjects Effects					
Condition***	.29	6.32	(6, 93)	< .001	.29
Condition x Gender	.06	.99	(6, 93)	.44	.06
Condition x Order	.09	.72	(12, 188)	.74	.04
Condition x Gender x Order	.08	.61	(12, 188)	.84	.04

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 2

Descriptive Statistics for Implied Conductor Age and Gender

	Male			Female			Overall		
Implied Age Condition	*M*	*SD*	95% CI	*M*	*SD*	95% CI	*M*	*SD*	95% CI
Accuracy									
Audio Only (AO)	8.13	1.12	[7.82, 8.45]	7.87	1.36	[7.49, 8.24]	8.00	1.25	[7.76, 8.24]
Younger Adult (YA)	7.88	1.08	[7.58, 8.18]	7.56	1.19	[7.23, 7.89]	7.72	1.14	[7.50, 7.94]
Middle Age Adult (MA)	8.08	1.17	[7.75, 8.40]	7.71	1.21	[7.37, 8.05]	7.89	1.20	[7.66, 8.13]
Older Adult (OA)	8.06	1.14	[7.74, 8.38]	7.75	1.25	[7.40, 8.10]	7.90	1.20	[7.67, 8.14]
Expressivity									
Audio Only (AO)	7.25	1.14	[6.93, 7.57]	7.00	1.27	[6.65, 7.35]	7.13	1.20	[6.89, 7.36]
Younger Adult (YA)	7.06	1.30	[6.69, 7.42]	7.15	1.32	[6.79, 7.52]	7.11	1.31	[6.85, 7.36]
Middle Age Adult (MA)	7.83	1.18	[7.50, 8.16]	7.38	1.32	[7.02, 7.75]	7.61	1.27	[7.36, 7.85]
Older Adult (OA)	7.85	1.33	[7.47, 8.22]	7.29	1.39	[6.90, 7.68]	7.57	1.38	[7.30, 7.84]
ICI									
Audio Only (AO)	5.48	1.64	[5.02, 5.93]	5.84	1.75	[5.35, 6.33]	5.66	1.70	[5.33, 5.99]
Younger Adult (YA)	5.44	1.75	[4.96, 5.93]	5.53	2.15	[4.83, 6.14]	5.49	1.94	[5.11, 5.87]
Middle Age Adult (MA)	5.33	1.96	[4.78, 5.87]	5.53	2.21	[4.91, 6.15]	5.43	2.08	[5.02, 5.83]
Older Adult (OA)	5.06	2.34	[4.41, 5.71]	5.25	2.04	[4.68, 5.83]	5.16	2.19	[4.73, 5.58]

Table 3

ANOVA Source Table for Improvement Capacity Ratings

Source	*SS*	*df*	*MS*	*F*	*p*	η^2_p
Between-Subjects Effects						
Gender	4.28	1	4.28	.36	.55	.004
Order*	77.68	2	38.84	3.29	.04	.06
Gender x Order	22.32	2	11.16	.95	.39	.02
Error	1,144.85	97	11.80			
Within-Subject Effects						
Condition*	13.75	3	4.58	3.79	.01	.04
Condition x Gender	.94	3	.31	.26	.85	.003
Condition x Order	2.51	6	.42	.35	.91	.007
Condition x Gender x Order	4.45	6	.74	.61	.72	.01
Error	352.07	291	1.21			

Note. Because Mauchly's test indicated that the assumption of sphericity was tenable ($p > .05$), no adjustments were made to the degrees of freedom for the within-subjects effects.

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 4

Frequency Distribution of Open Response Comments

	Positive Comments		Negative Comments		Neutral Comments		
Implied Age Conditions	*n*	%	*n*	%	*n*	%	Total
Audio Only (AO)							
Male	20	36	31	56	4	7	55
Female	18	38	26	55	3	6	47
Overall	38	37	57	56	7	7	102
Younger Adult (YA)							
Male	26	38	39	57	3	4	68
Female	19	32	36	60	5	8	60
Overall	45	35	75	59	8	6	128
Middle Age Adult (MA)							
Male	32	55	28	44	0	0	60
Female	24	47	24	49	3	4	51
Overall	56	50	52	47	3	3	111
Older Adult (OA)							
Male	27	47	29	51	2	2	58
Female	22	42	23	45	6	10	51
Overall	49	45	52	48	8	7	109

Note. In the Audio Only (AO) condition, male and female designations indicate the between-subject group, not the presence of visual stimuli.

SCHOOLWIDE PREDICTORS OF SOUTH CAROLINA MARCHING BAND SCORES BEFORE AND FOLLOWING THE COVID-19 PANDEMIC

Andrew M. Connolly

American school music programs have featured adjudicated contests and festivals for nearly as long as they have existed (Rohrer, 2002). The first statewide school music contest occurred in 1913 (McDow & Stiffler, 2020), and by 1930, eight states had held contests for at least five consecutive years (Moore, 2020; Williams, 1996). Around 1932, festival-type events, where adjudicators rated ensembles from Division I (Superior) to Division V (Poor), began replacing contests as critics argued that music directors focused too severely on "winning" contests. Marching band contests, however, primarily retained rank-based competition (Payne, 1997).

Music educators have long debated the benefits and consequences of music contests. Early supporters argued that the surge in school music competitions led to the rapid growth of school bands during the 1930s (Moore, 2020). Broadly, proponents claim that band and music contests stimulate better teaching, incentivize students to work hard, and yield better public relations in the community (Rohrer, 2002). Supporters argue that music competition strengthens both social and musical learning (Williams, 1996).

Contest proponents often claim, too, that competition motivates students. Millard (2014) found that nearly half the reasons choir teachers gave for music contest participation focused on boosting student work ethic and motivation. Glasscock (2021) similarly reported that 63% of surveyed band directors considered competition a motivator for students. Other findings indicate that music educators are right to believe that contest participation impacts student motivation. Gouzasis and Henderson (2012) wrote that contest participation motivated 80% of student participants to perform their best.

Although generations of scholars have found support for music contests, others criticize competition's role in music education. Soon after school music contests began, teachers and administrators argued that competitions conflicted with music's educational goals (Moore, 2020); contemporary scholars agree. Powell (2023) argued that competitive school music forces a neoliberal, capitalist perspective of music education. He asserted that music educators' focus on competitive success "flattens" (p. 55) the purpose of school music, thus excluding students from school music programs, discriminating against students and teachers from underrepresented communities, and diminishing students' educational experiences.

School stakeholders often support or criticize music educators based on their ensemble's contest results (Rohrer, 2002). Dawes (1989) cited a principal who indicated that contest awards

guaranteed whether band directors kept their jobs. For administrators with no music education experience, contest ratings can become convenient proxies for teachers' skill (Rohrer, 2002). A national push for teacher accountability exacerbated concerns that, given no large ensemble standardized test, administrators would assess teacher performance using ensemble festival results (Hash, 2013b). Perrine (2016) cautioned against this practice, citing the influence non-musical factors can have on adjudicated results.

Scholarship investigating adjudicator reliability has previously yielded noteworthy results (Hash, 2012; Hash, 2013a; Mick & Pope, 2018; Pope & Mick, 2018). For example, findings indicated high internal consistency (.90) when examining the American String Teachers Association's National Orchestra Festival ratings; however, over 80% of participating ensembles received a Superior (I) or Excellent (II) (Pope & Mick, 2018). Between 2010 and 2015, 94% of participating orchestras received a I or II rating at the Florida Orchestra Association Music Performance Assessment festival (Mick & Pope, 2018). From 2008 to 2010, approximately 86% of bands participating in South Carolina concert festivals received a I or II (Hash, 2012). Hash (2013a) also found that approximately 92% of bands and orchestras at the 2010 Virginia Band and Orchestra Directors Association festival scored a I or II. He noted, however, that it was difficult to determine whether this high interjudge reliability existed due to exceptional performance quality or low variation in results.

Some scholars have found contrasting results when examining interjudge reliability. Garman and colleagues (1991) examined interjudge reliability at the Dade County Orchestra Festival across five years and found correlational values between judges as low as 0.42. The "General Effect" caption was particularly low, with correlational values reaching 0.00 in two of the five examined years. Likewise, Latimer and colleagues (2010) found low reliability for the "other" caption in Kansas high school large-group festivals.

Limited adjudicator training might increase reliability concerns. Often, festival or contest judges receive no training before adjudicating events (Hash, 2013b; Rawlings, 2019). Barnes and McCashin (2005) reported that only 56% of states required judge training programs for their adjudicated orchestra events. More recent research suggested that although over 75% of state band performance assessments required judge training, only a little over half of states require judge training for orchestra and choir events (Tucker et al., 2024). This concern is further amplified by findings that interjudge reliability increased when Indiana adjudication panels received judge training (Brakel, 2006). Interestingly, Springer and Bradley (2017) found adjudicators exhibited bias even after training.

In addition to concerns about reliability and biases, researchers have studied the influence of factors unrelated to performance. Across several studies, scholars have found relationships between musical achievement and math test achievement (Bergee and Weingarten, 2021), director experience, private lesson participation, socioeconomic conditions (Lofdahl, 2023), and band size (Perrine, 2016). Additionally, Perrine found that smaller bands, bands from smaller

schools, and bands with more students who received free and reduced lunch (indicating lower socioeconomic status) tended to perform less difficult literature and receive lower ratings. Silveira and Silvey (2020) similarly found interaction between ensemble size and repertoire difficulty on adjudicated results, and ultimately recommended screened adjudication.

Competition also often brings financial and logistical difficulties. For example, Kansas music educators valued preparing for adjudicated events but identified multiple logistical challenges in attending them (Rawlings, 2019). Chiefly, teachers identified inconsistent financial resources. Millard (2014) found that 128 concert choir teachers spent almost a million dollars on competitive activity when totaling their budgets. Additionally, 106 show choir teachers spent approximately 2.4 million dollars toward competitive participation.

Unsurprisingly, researchers have examined similar factors associated with competitive marching band, which includes many non-musical components. Rickels (2008) collected several Arizona band program attributes including school demographic information, rehearsal statistics, and director characteristics. He found several factors predicted contest results, including budget, ensemble size, staff size, and number of festivals attended. He examined the same research questions in a national follow-up study and reported similar results (Rickels, 2012). Here, variation in band budget, band size, staff size, weekly rehearsal hours, and the director's attitude towards competitive marching band accounted for 50% of the variation in marching band scores. Lenard (2021) examined factors related to Bands of America (BOA) participating schools and found that these schools typically had fewer students receiving free or reduced lunch and higher income-to-poverty ratios than the national average. These findings echo several scholars who suggest socioeconomic factors broadly impact adjudicated performance results (Giroux, 2010; McGonigal, 2021; O'Leary, 2016; Stern, 2021; Stern, 2022).

The purpose of the present study is to examine the relationship between schoolwide non-performance factors and high school marching band scores in South Carolina before and following the COVID-19 pandemic. Specifically, I seek to answer the following research questions: 1) Does a relationship exist between schoolwide factors and marching band scores? 2) How does this relationship vary across school classification? While researchers have examined non-performance factors (Bergee & Weingarten, 2021; Lofdahl, 2023; Perrine, 2016; Rickels, 2008, 2012; Silveria & Silvey, 2020), previous literature has focused mainly on those non-musical factors that stakeholders influence (i.e., ensemble size, staffing, budget planning). Additionally, while several researchers have discussed ways music teachers adapted during the COVID-19 pandemic (Hash, 2020; Salvador & Harry, 2024; Shaw & Mayo, 2021), little research has investigated or documented the effects of the pandemic on ensemble performance and adjudication. Therefore, an additional purpose of this study is to compare pre and post-pandemic results to better understand this impact.

Method

To examine the pandemic's impact on contest scores, I examined data collected before the pandemic (2018) and after the return to the competitive circuit (2021). I chose to examine the following possible explanatory variables, all previously studied in the literature: school population size (Rickels, 2012), socioeconomic status (Lofdahl, 2021), and academic performance (Bergee & Weingarten, 2021). I collected possible explanatory variables from the 2018-19 and 2021-22 South Carolina school report cards (SC Report Cards, n.d.a; SC Report Cards, n.d.b). The South Carolina Department of Education publishes these data online yearly to assess school and district performance.

The poverty index score (i.e., the percentage of students living in poverty) reflects the school's socioeconomic status. The South Carolina Department of Education identifies students as living in poverty by their participation in the Supplemental Nutritional Assistance Program (SNAP), Temporary Assistance for Needy Families (TANF), Medicaid (within three years), or foster care, or by being identified as a migrant, homeless, or a runaway (State of South Carolina Department of Education, 2017). English I End of Course (EOC) exam performance and Algebra I EOC exam performance represent school academic performance. The state reports the percentage of students who score a C or higher on the exam as a performance metric. The state determines overall report card scores based on the following indicators: college and career readiness, graduation rate, academic achievement, and preparation for success. They report this score on a 100-point scale (SC Report Cards, n.d.c). I included the overall report card score as a metric for school-wide academic performance.

I used the total composite high school marching band scores (MB Scores) at the South Carolina Band Directors Association (SCBDA) preliminary contests across the state as the dependent variable (2018, $n = 117$; 2021, $n = 101$). The SCBDA posts these data on its website (South Carolina Band Directors Association [SCBDA], n.d.c; n.d.d). The composite score encompasses the following captions: music performance ensemble (20%), music performance individual (10%), visual performance ensemble (20%), visual performance individual (10%), overall effect music (20%), and overall effect visual (20%). The SCBDA holds preliminary marching contests annually at five different locations, using five different judging panels of six judges each. Including multiple adjudicator panels introduces greater possible extraneous variation. This extraneous variation is particularly concerning due to the previously discussed concerns in adjudicator training. The SCBDA does not publicly state how it chooses or trains marching adjudicators. Still, the event's preliminary nature allows a wider-ranging sample. I analyzed all data using R Statistical Software (R Core Team, 2024).

Table 1
Ranges, means, and standard deviations for all schoolwide variables

	2018				2021			
	Min	Max	*M*	*SD*	Min	Max	*M*	*SD*
MB Score	63.35	94.00	76.76	7.65	65.70	95.00	77.43	7.19
RC Score	35	80	61	8.6	32	79	59	9.7
Population	242	3,409	1,093	647	223	3,713	1,269	689
Poverty	18%	86%	55%	15%	15%	86%	55%	15%
English EOC	32%	89%	58%	11%	27%	84%	59%	12%
Algebra EOC	22%	89%	58%	13%	3%	83%	46%	15%

I chose to analyze all participating schools in the 2018 ($N = 115$) and 2021 ($N = 99$) SCBDA Preliminary Marching Contests (excluding two charter schools that did not receive school report cards). I present descriptive statistics in Table 1. Research question 2 concerns school classification. The SCBDA classifies bands every two years based on the previous year's 45-day enrollment numbers. Following the 2023-2024 school year, the SCBDA transitioned from five competing classifications to six competing classifications. Therefore, the classification size no longer matches that of the collected data. Prior to the addition of the sixth division, though, classifications were thusly based: class 5A contained the largest 24 high schools in the state, class 4A contained the next 41 largest high schools, class 3A and 2A each contained the next 40 largest high schools, and class 1A contained the remaining 140+ high schools (SCBDA, n.d.a).

Results

2018-19 School Year Data

I conducted a multiple regression analysis to evaluate how well school population size, percentage of students living in poverty, English EOC exam performance, Algebra EOC exam performance, and overall school report card score predicted marching band scores in the 2018-19 school year. Table 2 presents zero-level correlations, direct relationships without controlling for other factors, between marching band scores and all possible explanatory variables. The strongest relationship existed between the school population size and marching band scores ($r = 0.53$), $p < .001$). The next strongest relationship existed between students living in poverty and marching band scores ($r = -0.44$, $p < .001$). A similar relationship existed between English I and Algebra I EOC exam performance and marching band score ($r = 0.37$, $p < .001$ and $r = 0.32$, $p < .001$, respectively). The weakest relationship was between the overall school report card score and the marching band score ($r = 0.27$, $p = .003$).

Table 2
Means, standard deviations, and correlations with confidence intervals for the 2018 dataset

Variable	M	SD	1	2	3	4	5
1. MB Score	76.76	7.65					
2. Report Card Score	61.47	8.55	.27** [.09, .43]				
3. Population	1220.20	646.79	.53** [.38, .65]	.27** [.09, .43]			
4. Poverty	54.94	15.14	-.44** [-.58, -.28]	-.76** [-.83, -.67]	-.50** [-.63, -.35]		
5. English EOC	58.58	11.36	.37** [.20, .52]	.84** [.77, .89]	.42** [.25, .56]	-.84** [-.88, -.77]	
6. Algebra EOC	57.40	12.63	.32** [.15, .48]	.77** [.69, .84]	.37** [.20, .52]	-.76** [-.83, -.67]	.87** [.81, .91]

*$p < .05$. **$p < .01$.

I first constructed a full multiple regression model, examining the relationship between marching band score and school population, overall Report Card rating, English I EOC performance, Algebra I EOC performance, poverty index, and graduation rate. This model accounted for 32% of the variation in marching band scores. While the model itself was very stable ($p < 0.01$), several variables within the model were unstable. Specifically, the *p*-values of the overall report card score, English I EOC score, and Algebra I EOC score factors were too high to include in the final model.

Due to the instability of several variables, I built a final model, examining marching band scores as a function of the poverty index and school size. I present this model in Table 3. With three fewer explanatory variables, this model lost no predictive ability compared to the full model. Additionally, this model was as equally stable as the full model ($p < .001$) while the variables within the model remain stable. The final model for predicting marching band scores from school report card data in the 2018-19 school year was $Y = 77.27 + (0.005*\textit{Population}) + (-0.12*\textit{Poverty Index})$. Further, I can predict with 95% confidence that for each 100-student

increase in the school's population, the average composite marching band score would increase by between 0.2 and 0.7 points if the other model explanatory variable remained constant.

Table 3
Final regression model for the 2018 dataset

Predictor	*b*	*b* 95% CI [LL, UL]		95% CI [LL, UL]	*p*
(Intercept)	77.27**	[70.55, 83.99]			<0.001***
Population	0.005**	[0.003, 0.01]	0.41	[0.23, 0.59]	<0.001***
Poverty Index	-0.12*	[-0.21, -0.03]	-0.23	[-0.41, -0.05]	0.011

Residual Standard Error: 6.36 on 112 degrees of freedom
Multiple R^2: 0.32, Adjusted R^2: 0.31

F (2, 112) = 26.33, $p < 0.001$***
*$p < .05$. **$p < .01$, ***$p < .001$

In examining correlation by class, Class 2A and Class 3A yielded statistically significant findings ($p = 0.02$ and 0.01, respectively). However, their predictive ability was relatively low and not very meaningful ($R^2 = 0.06$ and 0.09, respectively). Class 5A had the highest coefficient of determination ($R^2 = 0.18$). However, the model was too unstable ($p = 0.08$) to confidently claim a definitive relationship.

2021-22 School Year Data

Table 4

Means, standard deviations, and correlations with confidence intervals for the 2021 dataset

Variable	*M*	*SD*	1	2	3	4	5
1. MB Score	77.43	7.19					
2. Report Card Score	58.96	9.71	.35** [.17, .52]				
3. Population	1268.53	683.80	.55** [.40, .68]	.25* [.05, .42]			
4. Poverty	55.19	15.35	-.51** [-.65, -.35]	-.79** [-.86, -.71]	-.46** [-.61, -.29]		
5. English EOC	59.24	12.09	.43** [.26, .58]	.73** [.62, .81]	.41** [.23, .56]	-.77** [-.84, -.67]	
6. Algebra EOC	45.95	14.99	.46** [.28, .60]	.70** [.59, .79]	.43** [.25, .58]	-.74** [-.82, -.64]	.83** [.76, .89]

*$p < .05$. **$p < .01$.

Again, I conducted a multiple regression analysis to evaluate how well the 2021-22 school report card data predicted marching band scores. Table 4 provides zero-level correlations across marching band scores and all possible explanatory variables. Similar to the 2018-19 dataset, the strongest relationships existed between school population and percentage of students living in poverty and marching band scores ($r = 0.55$, $p < .001$ and $r = -0.51$, $p < .001$, respectively). Similar relationships exist between English I and Algebra I EOC exam performance and marching band scores ($r = 0.43$, $p < .001$ and $r = 0.46$, $p < .001$, respectively). The weakest relationship exists between the overall school report card and marching band scores ($r = 0.35$), $p < .001$.

I began with a full regression model, examining marching band score as a function of overall report card score, school size, percentage of students living in poverty, and English I and Algebra I EOC exam performance. This model can account for 39% of the variation in marching

band scores. Like the full model from the 2018-19 dataset, the model itself is quite stable ($p <$ 0.001), though several variables within the model are unstable. Instead of this model, I retained the same final model from the 2018-19 dataset, examining marching band score as a function of school size and percentage of students living in poverty. I present that model in Table 5. When applied to the 2021-22 dataset, the specific model is $Y = 80.57 + (0.004*Population) + (-0.15*Poverty\ Index)$.

Table 5

Final regression model for the 2021 dataset

Predictor	*b*	*b* 95% CI [LL, UL]		95% CI [LL, UL]	*p*
(Intercept)	80.57**	[74.36, 86.79]			<0.001***
Population	0.004**	[0.002, 0.01]	0.40	[0.22, 0.58]	<0.001***
Poverty	-0.15**	[-0.24, -0.07]	-0.33	[-0.51, -0.15]	<0.001***

Residual Standard Error: 5.77 on 96 degrees of freedom
Multiple R^2: 0.39, Adjusted R^2: 0.38

F (2, 96) = 30.5, $p < 0.001$***

*$p < .05$. **$p < .01$, ***$p < .001$

This model is more parsimonious than the full model, having three fewer variables and losing no predictive ability. This model and its variables are also stable ($p < 0.001$). Further, I can predict with 95% confidence that if the percentage of students living in poverty increased by 10 percentage points, one would find an average decrease in the composite marching band score by between 0.7 and 2.4 points if the other model explanatory variable remained constant. Additionally, for each 100-student increase in the school's population, one would find an average composite marching band score increase by between 0.2 and 1 points if the other model explanatory variable remained constant.

When examining the final model separated by band classification, interesting trends emerge. Table 6 shows those findings. Only two band classifications (3A and 5A) yield statistically significant results ($p = 0.03$, $p < 0.01$, respectively). Particularly interesting are findings associated with class 5A, which indicate that variation in school size and school poverty accounts for 66% of the variation in scores. Although the small sample size ($n = 14$) rightly warrants hesitant generalization of these results, further examining the 5A data indicates normal and homoscedastic residual distributions, suggesting inference is valid.

Table 6

Regression coefficients by class for the 2021 dataset

Classification	*r*	R^2	*p*
1A (*n* = 13)	0.32	0.10	0.58
2A (*n* = 22)	0.32	0.10	0.37
3A (*n* = 25)	0.40	0.25	0.03
4A (*n* = 25)	0.39	0.15	0.16
5A (*n* = 14)	0.81	0.66	<0.01

Discussion

The purpose of this study was to examine the relationship between schoolwide non-performance factors and high school marching band scores in South Carolina before and following the COVID-19 pandemic. Specifically, I examined state preliminary marching contest results as a function of school population size, the percentage of students living in poverty, schoolwide English I End of Course (EOC) exam performance, schoolwide Algebra I EOC exam performance, and overall school report card rating. I also examined data from two separate school years, 2018-19 and 2021-22, to compare results before and after the COVID-19 pandemic.

A thorough examination of the state report card data exceeds this study's scope; however, some findings warrant brief discussion. It is notable that in both models, the relationships between poverty and every academic success measure were strongly correlated. In 2018, the percentage of students living in poverty was strongly correlated to English I EOC performance (r = -0.84), Algebra I EOC performance (r = -0.76), and overall report card score (r = -0.76). In 2021, the percentage of students living in poverty was, again, strongly correlated to English I EOC performance (r = -0.77), Algebra I EOC performance (r = -0.74), and overall report card score (r = -0.79). While researchers have extensively discussed the relationship between poverty and education (Connell, 1994; Ladd, 2012; Ullucci & Howard, 2014), these data reflect a concerning trend and echo the findings of the present study.

More pertinent, findings indicate that a model predicting marching band scores as a function of the schoolwide percentage of students living in poverty and the school population size accounts for about 32% of the variation in marching band scores based on 2018-19 school-year data. An identical model accounts for about 39% of the variation in marching band scores based on 2021-22 school-year data. Models from both years were quite stable ($p < 0.001$). However, the data following the pandemic can account for about seven more percentage points of variation compared to the data before the pandemic. This suggests that the percentage of

students living in poverty and school population had a stronger association with marching band scores following the pandemic.

The change in the number of competing bands per class between the two years is noteworthy. The three smallest class sizes (i.e., 1A, 2A, and 3A) had fewer participating bands when comparing 2018 and 2021, while the larger class sizes (i.e., 4A and 5A) had more participating bands. When examining the 2021 data by classification, two interesting relationships between classification and results emerged. The final model, applied to bands in the 3A classification, accounts for 25% of the variation in marching band scores ($p = 0.03$). The final model, applied to bands in the 5A classification, accounts for 66% of the variation in marching band scores ($p < 0.001$). This suggests that the discussed relationship may be particularly robust in class 5A bands. It is interesting, here, to consider the possible effects of the COVID-19 pandemic; the first competitive season following the COVID-19 pandemic had fewer competing bands from small schools and more competing bands from larger schools. It is possible that the pandemic more adversely affected smaller schools in funding or enrollment, and they did not feel compelled to compete.

In general, these findings are congruent with previous research, which has shown that poverty and socioeconomic status (Giroux, 2010; Lenard, 2021; McGonigal, 2021; O'Leary, 2016; Stern, 2021; Stern, 2022) and school size (Lenard, 2021; Perrine, 2016) relate to adjudicated performance results. Notably, several researchers have explored ensemble size and competitive success (Lofdahl, 2023; Perrine, 2016; Rickels, 2008, 2012; Silveira & Silvey, 2020). However, the SCBDA does not classify bands by ensemble size. Instead, they classify based on school enrollment (SCBDA, n.d.a). In contrast to research showing a relationship between academic factors and competitive success (Bergee & Weingarten, 2021), I found no evidence of a similar relationship in these data.

It is important to remember that the model's predictive ability presented in this study does not indicate causation; one could claim, based on these data, that poverty level and school population size variation can predict variation in South Carolina marching band scores. One could not say, however, that poverty and school population cause changes in marching band scores. Still, the robustness of this relationship is concerning. There are several potential causes for this connection. First, it is reasonable to assume that larger schools will produce larger bands. Research has found relationships between ensemble size and competitive success (Lofdahl, 2023; Perrine, 2016; Rickels, 2008, 2012; Silveira & Silvey, 2020). It is also possible that larger schools yield a bigger "talent pool," a greater number of high-performing students.

One might also suggest that schools with fewer students living in poverty will yield greater financial support for band programs. This support can lead to more reputable and more expensive show design, a larger instructional staff, and more student opportunities. Further, the non-musical results of the present study suggest that schools with fewer students living in poverty experience higher English I and Algebra I EOC test scores. It is not surprising, then, that this factor also predicts competitive musical success.

Although a relationship between school size and poverty and marching band contest results may not be surprising, the variables in the final model are beyond the control of any music educator or stakeholder. Although music teachers cannot implement stronger recruitment strategies to increase school size, these findings indicate a relationship between school size and contest results. Although music educators cannot advocate for more funding from their school district to address the percentage of students living in poverty, these findings indicate a relationship between the percentage of students living in poverty and contest results. To address these concerns, I propose practical and philosophical solutions that may mitigate the severity of this troubling correlation.

Organizations must ensure judges are properly trained in assessing ensemble performance using the prescribed rubric. Previous research has indicated that even limited training may increase interjudge reliability (Brakel, 2006), but that contest judges often receive no training prior to adjudicating events (Hash, 2013b; Rawlings, 2019). Although the SCBDA lists an Adjudicators Handbook on their website (SCBDA, n.d.b), they give no reference to what adjudicator training, if any, is required before scoring marching contests.

Additionally, all stakeholders must carefully and accurately frame the results of both desired and undesired contest outcomes. These results occur in the context in which they were achieved, schools and students' lives, a context that must be discussed. This discussion does not cheapen success or excuse poor performance; it appropriately reflects the reality in which results occurred. Excluding this context perpetuates a false meritocracy equating competitive success with ability and effort, and further obfuscates the complexities associated with competition results.

The present study has some limitations, the largest being that the sample represents only one state. This eases data collection and direct comparison but limits the study's generalizability. Future research should examine similar relationships in other states and regions. Expanding the sampled states could also expand the sample size. Although the overall number of sampled bands in 2018 and 2021 was relatively large ($N = 115$ and 99, respectively), the number of bands in each class was relatively small. A larger sample would increase the statistical power of the model.

Further, although analyzing only the two years near the COVID-19 pandemic accounts for some extraneous variation, it limits the scope of the findings. Analyzing results from other years would be interesting (perhaps necessary) to determine whether the changes observed in the study were due to the pandemic or merely coincidental. Scholars should examine different years to clarify how the relationship between poverty and school population has changed over time. Examining different years may also reveal more about the smaller number of participating schools following the pandemic. Specifically, scholars should research how the COVID-19 pandemic affected school band programs of different sizes and resources, and whether this trend persists.

Additionally, although using the state preliminary results allows for a wider ranging sample, it also introduces extraneous variation through its use of five different adjudication panels. That is, five different panels determined the dependent variable for the study. Still, these panels utilized the same score sheet and rubrics and, presumably, underwent the same level of training. It is important to note, however, that the SCBDA does not publicly state how it chooses or trains adjudicators. That is, it is not clear what training, if any, adjudicators receive before the competition. This limitation is not unique to the present study; indeed, it is common amongst nearly all research that attempts to examine adjudicated results across a large sample.

One might consider my using adjudicated results as the dependent variable as problematic; however, the extraneous variation that arises from music contests makes the research even more necessary. School stakeholders associate much value with these adjudicated results (Dawes, 2018; Pope & Mick, 2018; Rohrer, 2002). Therefore, it is important to understand what factors influence contest performance, however problematic the results may be. Indeed, I did not intend to examine the relationship between the collective explanatory variables and band performance quality. Instead, I aimed to examine the relationship between these explanatory variables and marching band scores.

Despite these limitations, music educators must ask how comfortable they feel with such a strong relationship as that found herein. Again, these explanatory variables are not ones within any stakeholder's control. Further, as Bates (2012) writes, the danger in perpetuating a false meritocracy is that students from low-income families and smaller schools may believe that a lower placement results from an insufficient work ethic. Worse still, they may believe a false notion that they are less capable. Music educators must better understand the variables that influence adjudicated results and ensure that these outcomes, celebrated or lamented, are presented as one small aspect of the overall music-making experience.

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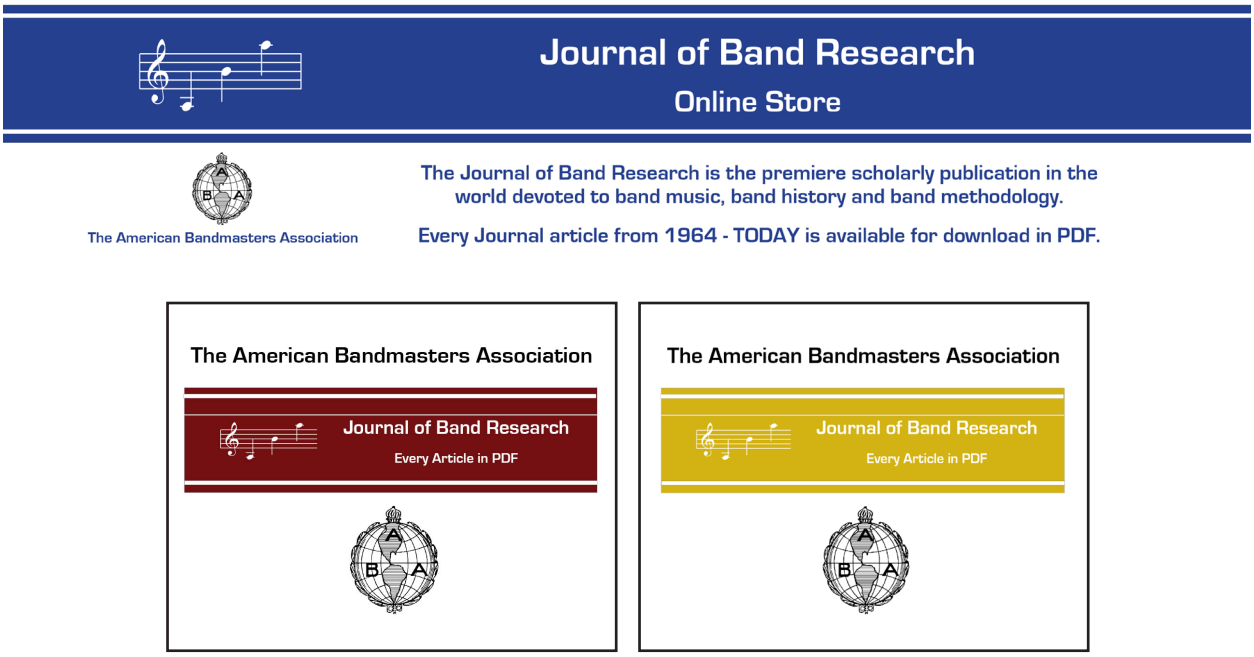

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Dr. David Kish, Manager, JBR Store

To the Readership of the ABA Journal of Band Research,

I have important news to share with all of you.

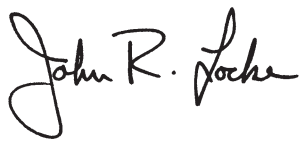
It has been my great honor to have served as Editor of *The ABA Journal of Band Research* since January 2009. I was asked to take over as JBR Editor by the previous Editor, Dr. William J. Moody, who was also the long-serving Secretary-Treasurer of the American Bandmasters Association. I am only the sixth person to serve in this role since the JBR founding in 1964.

I have completed 17 years of service in the role of Editor, longer than any other Editor, and I have enjoyed this journey very much. I personally subscribed to the JBR when I was just 23 years old and started purchasing all the back issues that (then) Troy State University had on hand. The topic of band research has always been in my blood and I have given much of my attention to this calling for a very long time. I published my own research in the JBR. I initiated the first JBR Website back in 2010 and, over time, improved it with the present website. As our JBR website states and I know to be true: ***The ABA Journal of Band Research is the premiere scholarly publication in the world devoted to band music, band history and band methodology.***

I believe that it is now time for me to "pass the torch" to an exceptionally brilliant researcher, author, band director and colleague. Since 2019, **Dr. David Kish** has been serving as my right hand in the execution of all things related to *The ABA Journal of Band Research*. Dr. Kish was instrumental in the realization of my long-time dream to have a **JBR Store online** which contains every article ever published in the JBR from 1964 to the present available for an immediate download at a nominal cost. Dr. Kish is a tenured professor of music at Metropolitan State University in Denver, CO and conductor of the Colorado Wind Ensemble, a superb, auditioned community band. Dr. Kish has published his own research in the JBR and also has no less than *seven* published books on band literature and teaching which he authored, all published by Meredith Music/GIA.

I want to express my sincere thanks for the superb job done by the members of the Editorial Review Board, the Associate Editor Dr. Mark Walker, and Managing Editor Christina Charles. It surely takes a village of dedicated people to make the *ABA Journal of Band Research* the excellent product that it has been.

Yours sincerely,



John R. Locke, Editor Emeritus
The ABA Journal of Band Research