WHO TAKES MUSIC WITH THEM WHEN THEY TRANSITION TO HIGH SCHOOL?

by

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A Thesis submitted in partial fulfillment of the requirements for the degree of Master of Arts at George Mason University

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Bachelor of Science
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DEDICATION

To those that stood in front of me, next to me, and allowed me to stand in front of them doing this thing we call music.

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ABSTRACT

WHO TAKES MUSIC WITH THEM WHEN THEY TRANSITION TO HIGH SCHOOL?

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While there is ample evidence that music is one of the most widely available and enrolled-in arts elective among American adolescents today, less is known about how this relates to continued enrollment within music (i.e., persistence). According to claims from music educators, persistence beyond a student's initial enrollment in middle and high school music is a real problem in the U.S. and worldwide, making one-time enrollment metrics a misleading indicator of music's popularity and success in schools. Empirical evidence that verifies music educators' claims, all while exploring the various ways that students who persist differ from those who do not, is long overdue. This paper builds off prior work with the Miami School Readiness Project (MSRP; Winsler et al., 2020; Alegrado & Winsler, 2020), by prospectively following a large (n = 3,393), majority Hispanic (62%), sample of adolescents from middle to high school (8th–9th grade), to better understand predictors of persistence within in-school music electives. Overall, only

24.5% of students taking any music elective in 8th grade continued to take any music elective in 9th grade (persistence rates varied when only looking within each music type; band, chorus, guitar, orchestra). Regression analyses showed that more academically competent students (higher 8th grade GPA and 8th grade reading and math scores), and students with disabilities, were more likely to persist with any music from 8th to 9th grade (predictors varied when looking within each music type). A multigroup analysis directly compared what predictors of any-music persistence varied by music type, finding there was significant moderation across music types with respect to the effect of gender, gifted status, and math scores on any-music persistence. Implications, for both music educators and researchers, are discussed.

WHO TAKES MUSIC WITH THEM WHEN THEY TRANSITION TO HIGH SCHOOL?

Music courses in middle and high school are some of the most widely available (Elpus, 2020) and enrolled in (Elpus & Abril, 2019) arts electives students can take in the U.S. today. One of the reasons for music's continued popularity in schools is its esteemed reputation among the vast majority of the American public (National Association of Music Merchants [NAMM], 2009, 2011). This positive image is reinforced by a large body of research literature that largely correlates musical enrollment with a plethora of positive cognitive, social, and academic outcomes (Hallam, 2010), often leading to overstated claims throughout the popular press (Mehr, 2015). This literature, though, merely compares musicians to non-musicians and claims that the student's participation in music alone is the driving force behind these better outcomes (Schellenberg, 2020). Many researchers in the field have since called this logic into question (Foster & Jenkins, 2017; Mehr, 2013; Winner & Cooper, 2000; Winner et al., 2013), providing evidence that students who choose to enroll in music already look very different early on from students who choose not to enroll in music on a variety of demographic, socioeconomic, and achievement metrics both in middle school (Kinney, 2008) and high school (Elpus & Abril, 2011). These *selection effects* between takers and non-takers of music highlight the importance of being able to control for pre-existing differences over time, allowing for a more accurate depiction of what benefits, if any, music actually offers to its students.

But despite music's initial appeal, many music educators claim that this interest appears to be short-lived for the vast majority of their students, leading to a "dropout problem" (i.e., students only remaining enrolled in music for one to two years and then quitting; Boyle et al., 1995; Corenblum & Marshall, 1998; Evans et al., 2012; Klinedinst, 1991; Ng & Hartwig, 2011; Sichivitsa, 2004; Stewart, 2005; Williams, 2007). Unfortunately, this supposed dropout problem has not been studied at a large scale, leaving music educators without much evidence to back up their lived experiences. Just like prior research on initial enrollment into music, an important first step for this line of research (in addition to providing empirical evidence that there is a dropout problem in the first place) is to parse out how students who continue to enroll in music are different from those who do not. Specifically, better understanding how selection effects for initial music enrollment (i.e., selection) relate to continued music enrollment (i.e., persistence) would be fruitful for the field. While this "first step" will be the central focus of the current study, it is important to note that better understanding persistence from middle school to high school is informative for at least three additional reasons.

First, persistence lets one better understand student access to music over time, especially as they transition from one school to another (e.g., middle to high school; Symonds et al., 2017). For example, fewer students being involved in music in 9th grade, as compared to 8th grade, does not necessarily mean that fewer students *wanted* to be involved in music that year. Without understanding differences in access from middle to high school, claims of students losing interest and selecting not to enroll cannot accurately be studied.

Second, once access is accounted for, studying choices to persist within music *in adolescence* becomes a much more complex question than in earlier age groups (e.g., because parental influence is a primary indicator of enrollment within earlier age groups; Persson et al., 2007). Adolescence is marked by profound changes, specifically in personal and social development (Blakemore & Mills, 2014). This stage in development is marked by three core tasks or milestones: the quest for autonomy (the desire to make one's own choices, largely exerted through a combination of independence and exploration; Allen & Loeb, 2015; Dahl et al., 2018; Steinberg, 2015), the search for identity (figuring out what qualities make up themselves, as well as the groups they affiliate with; Erickson, 1980; Marcia, 1980; Stets & Burke, 2000), and the desire for intimacy (the want to strengthen social relationships with peer groups, adult role models, and potential romantic partners; Allen et al., 2020; Brown, 2004; Smetana et al., 2006). Understanding the changes students are going through during this stage of development, all during a major transition from middle to high school, can provide context and nuance (that studies with the ability to, should explore) to the many factors that go into a student's decision to *choose* to continue to enroll in music at this particular point in their life (Evans & McPherson, 2017). This is especially important in a transition (from middle to high school) that offers students *even more* enrollment choices and slots than they have ever had previously (Symonds et al., 2017).

Third, studying persistence is important because research suggests that the *amount* (i.e., the dosage) of music individuals partake in matters for outcomes (i.e., more music, more benefits). In a foundational study, Schellenberg (2006) showed that within

6-to-11-year-olds that had already selected to take music lessons (*M* exposure to lessons = 23 months), that each month of music lessons was associated with a 1/6th point increase in IQ after controlling for the effects of age, parental education, family income, and other nonmusical activities engaged in at the time. In other words, six years of music lessons in childhood would equate to a 7.5-point bump (half a standard deviation) in IQ. Additionally, continued musical engagement into adulthood seems important for later life outcomes and overall well-being (Koehler & Neubauer, 2020).

Taken together, it would seem that having as many students as possible continue on to additional years of music would be a fundamental goal of any and all middle and high school music programs. A different approach (i.e., allowing music to be something a student just gets to experience once to try it out, and not focusing on retaining the interest and continued enrollment of each student at all) would appear counterproductive for ensuring that the student gets the most out of music possible (today and later in life), as well as cementing the longevity of funding, community and administrative support, and student interest in the school's music program for years to come (Major, 2013).

Benefits of (Sustained) Music

Active music engagement is thought to be beneficial because of its broad, positive impact on intellectual, social, and personal development (i.e., in language development, literacy, numeracy, cognitive processes, creativity, fine motor coordination, concentration, self-confidence, emotional sensitivity, social skills, team work, self-discipline, and relaxation; see Hallam, 2010). But considering the dosage of music (i.e.,

the number of years involved) appears to be important for outcomes as well (dos Santos-Luiz et al., 2016; Schellenberg, 2006; Wetter et al., 2009).

In a cross-sectional study, Wetter et al. (2009) showed that instrumental musicians did not perform any different than their non-musical peers academically in 3rd grade (each child's initial engagement with music), but 6th grade musicians significantly outperformed their non-musical peers academically (across all subjects), even after controlling for socioeconomic status. Importantly, in a longitudinal study, dos Santos-Luiz et al. (2016) found that from 7th to 9th grade, musicians performed better academically than non-musicians (across all subjects), even after controlling for socioeconomic status, intelligence, motivation, and prior academic achievement.

Generally, these studies seem to show that the more one is involved with music, the more beneficial music appears to be for positive psychological outcomes. But unfortunately, most evidence of music's benefits comes from static, short-term time points and weak correlational designs. While many of these short-term correlational studies should be interpreted with caution, this literature serves as the foundation for much of our understanding of music's positive psychological benefits.

The literature on associated, but non-causal, non-musical benefits from music participation is vast and influential (Butzlaff, 2000; Cabanac et al., 2013; Gouzouasis et al., 2007; Vaughn & Winner, 2000). But (like in the dosage studies mentioned above) no non-musical benefit has received more attention from researchers, policy makers, educators, parents, and students than music's effect on academic performance in core school subjects like reading and math (Cabanac et al., 2013; Vaughn & Winner, 2000).

This is the "golden goose" of music's proposed benefits within mainstream consciousness. This logic is simple from an advocacy standpoint: school is for making kids "smarter" (e.g., through high competency on math and literacy assessments in school, which is intended to help kids become better adjusted for the "real world"), music is in schools and is associated with "smart" kids, therefore music belongs in schools and helps make kids "smarter."

Music's link to favorable academic outcomes has long been perceived as a core reason for music's high levels of initial enrollment (Parsad et al., 2012) and funding from the local, state, and federal level (Baker, 2012; Major, 2013) compared to other in-school art forms. A nation-wide survey of the American public showed that 9 in 10 adults agree with the statement, "Participating in school music corresponds with better grades/test scores" (NAMM, 2011). Therefore, many parents likely encourage their children to pursue music not just for music's sake, but under the assumption that it will enrich other areas of development (Costa-Giomi & Chappell, 2007).

Because the music and academic performance connection is so palpable in colloquial discourse, it has been tempting for researchers to use this line of evidence to defend music in our education system today. Not only does this overemphasis of increased academic performance take away from music's core offerings to society and psychological development in and of itself (Winner et al., 2013), it repeatedly uses an empirically-weak body of literature to substantiate these claims (creating a never-ending positive feedback loop with how these results get conveyed through mainstream media outlets and further misinterpreted by the general public; Mehr, 2015).

Isolating the effects of music in a randomly assigned experimental trial (ideally on all "musically curious" non-musicians, or all equally experienced novice musicians) would seemingly solve this experimental design problem. Unfortunately, it is next to impossible to actually implement this design in a school setting without dramatically altering the structure of the school's music program, or without completely taking away a student's choice to be enrolled in music or not (Holochwost et al., 2017; Winner & Cooper, 2000; Winsler et al., 2020). But, some randomized controlled trials have been run, showing promising and causal results (Gardiner et al., 1996; Schellenberg, 2004 for cognitive gains; Holochwost et al., 2017 for academic gains; and Holochwost et al., 2017; Moreno et al., 2011 for executive function [EF] gains).

Using a true experimental design, Holochwost et al. (2017) provide evidence within older children/pre-adolescents for extra-musical outcomes from music training within a school context. Two hundred and sixty-seven students (M = 10.2 years-old) were randomly assigned to either a music or control group, eliminating the role of selection effects. Holochwost et al. found that the music group significantly outperformed the control group on academic achievement and EF measures. This study offers a significant contribution to the literature largely because of its external validity; using random assignment within a diverse population of grade-school aged students in a program that resembled the natural year-round process typically seen in a "normal" music program. Future studies need to continue to strive to implement experimental designs to allow for causal claims about music to be more confidently identified and more thoroughly understood.

But in lieu of true experimental designs, there is still a need to better understand the benefits of music, within the normal school context, beyond just their association to an outcome. To answer this call, carefully controlled quasi-experimental designs seem uniquely suited to assist music researchers. With these stronger empirical designs, researchers have already shown that musicians already look very different from non-musicians on a demographic, socioeconomic, and academic level before students even begin involvement within in-school music (Alegrado & Winsler, 2020; Elpus & Abril, 2019; Kinney, 2019; Winsler et al., 2020). These pre-existing selection factors underscore the need to move away from misguided claims that music is driving musicians to have higher academic achievement compared to non-musicians, but rather, move to more strictly control for these pre-existing demographic, socioeconomic, and academic achievement differences when trying to provide evidence in support of the "music makes students smarter" claim (Kinney, 2019; Winsler et al., 2020).

While music may strengthen, or co-occur with, specific cognitive aspects that may have small transfer value to other academic subjects (Schellenberg & Weiss, 2013), the reality is that students that self-select to be musicians are already performing better early in school than their peers (Elpus & Abril, 2019) and show signs of this trend as much as seven years before they enroll in music (Alegrado & Winsler, 2020)—making it hard to disentangle if music improves cognitive processes, or if individuals with strong cognitive processes are predisposed towards music. For example, Clayton et al. (2016) study how college-aged (N = 34) musicians and non-musicians differ on EF performance in the United States. These participants were just sampled once and then compared on

their performance on a battery of tests, including four EF measures (Auditory Working Memory, Backwards Digit Span, Stroop Test, and Design Fluency Test). There was no random assignment, manipulations, or variance in timepoints within this study. After this one time point, musicians showed significantly better performance on the auditory working memory task compared to non-musicians. The authors state that this study helps corroborate previous research that shows that musicians have increased domain-specific (i.e., auditory) EF in areas like selective attention and working memory (i.e., "the cocktail effect;" Clayton et al., 2016). This supports research that ties music's domain-specific auditory strengthening to improvements in linguistic skills (Ho et al., 2003), thus leading theorists to believe this auditory-linguistic link is a key mechanism driving the broader academic performance gains that music appears to offer (Kraus & Chandrasekaran, 2010). But ultimately, without random assignment, Clayton et al.'s (2016) study could also be explained as individuals with already better auditory skills (that then choose to be musicians) performing better on auditory tasks than individuals with weaker auditory skills (that chose not to be musicians).

Overall, more experimental and—rigorously controlled—quasi-experimental studies are needed to not only investigate this link between musicianship and achievement at a given time point, but to investigate this link over time. Truly understanding music's importance, especially in the context of an *optional* school elective, will require knowing how students who *choose* to continue to enroll differ from those who do not. And importantly, if outcomes do strengthen over increased musical involvement, this connection would not only argue for continuing to better understand

persistence, but to actually encourage it (ideally, by targeting those most at-risk of quitting music). Sustained involvement may benefit the student, but it also benefits the program. Nurturing students *already engaged* with music seems like a much more sustainable strategy for a program than trying to recruit new students at each and every grade. Ultimately, it is in everyone's best interest to make sure that a student's experience with music is positive enough that they would want to continue to enroll in it the following year, especially during the ever-important period of adolescence.

Adolescence

In-school music's impact on adolescent development is not studied as frequently as music's impact on early childhood development, despite each period's sensitivity and malleability to profound psychological development (Barrett & Bond, 2015; Campbell et al., 2007). Adolescents are enduring physical (Blakemore et al., 2010), cognitive (Blakemore & Mills, 2014), and social (Eccles, 2009; Wang & Eccles, 2012) changes and transitions internally, all while being submitted to a host of societal and environmental changes externally (Dahl et al., 2018; Eccles & Roeser, 2011; Guest & Schneider, 2003). These external changes include but are not limited to: moving from middle school to high school (Langenkamp, 2011; Seeskin et al., 2018), entering the workforce (Moshman, 2011), and taking on bigger roles at home (Chen & Gregory, 2009) and at school (Eccles & Barber, 1999). All of these changes share the common thread of increased responsibility and a greater sense of autonomy, ultimately acting as a bridge into adulthood (Nelson et al., 2008).

The transition between middle and high school in the U.S. typically takes place between 8th and 9th grade, and typically requires students to move to a different—larger—school building (Symonds & Galton, 2014). This transition will fundamentally alter the conditions in which a student will strive for relatedness, autonomy, competency, safety, enjoyment, and identity development within their school (Symonds & Galton, 2014; Symonds et al., 2017). Underscoring the challenges students face during this transition, studies show that lower GPA's, lower school attendance, higher rates of substance use, and higher school dropout rates are all prevalent during this transition (e.g., Neild, 2009). During this exceptionally variable time, having music as a *constant* during this transition can be a critical protective factor. Importantly, these students are not just bringing music with them to high school—they are also bringing with them the broader developmental context that in-school music fosters.

This broader context in middle and high school music classes separates itself from general music instruction found at the preschool and elementary level by integrating important concepts such as the pursuit of excellence as a group and as an individual, an environment that can become a "second family," the emphasis on hard work and short-term efforts leading to long-term results, and the lesson that success in any field lies within the care and mastery of the details (Adderley et al, 2003; Dagaz, 2012; Hoffer, 1991; Powell et al., 1985). These added layers (e.g., striving for excellence, competition, strong peer relationships) make in-school music in middle and high school less of an exclusive skill of being able to play a musical instrument, and more of a mindset, culture, and context for healthy adolescent development. In-school music thus becomes one of

many possible vehicles for adolescents to strengthen their broader "life skills" and level of responsibility as they prepare for adulthood (Dahl et al., 2018).

Music, as well as other art forms, inherently develops "artistic habits of mind" and introspective meaning that are unique in a school setting (Hetland & Winner, 2001; Winner et al., 2013). Music can challenge students in ways that science, math, and reading cannot (e.g., there are no right or wrong answers in music, and a ceiling for musical possibilities has no limit). Students who thrive in all subject areas may struggle with music, which offers a solid argument for music's inclusion in schools. Students who breeze through their honors and AP classes may go through school without ever facing a challenge, or more importantly, failure. High school graduates will soon have to face the uncertainty and adversity of the "real world" as they grow closer to adulthood. Making sure that students have fallen, gotten back up, and learned from a failure before transitioning into adulthood is crucial (Dahl et al., 2018).

But these "habits of mind" can just as much be used to explain why music can help students, especially those struggling in school, do better in school. For example, Schellenberg et al. (2015) found that music increased prosocial behavior in children, but only for those who had poor prosocial skills to begin with. These increased outcomes for the most disadvantaged students could easily be reduced down to common statistical properties (e.g., floor/ceiling effects), but some researchers argue that the unique, integrated environment of music classes (i.e., where high and low academic performers are mixed) is a feature, not a bug, of the outcomes observed from music. Hogan and Winner (2019) suggest that there are eight musical habits of mind that are taught and

fostered within integrated music classrooms (i.e., engage and persist, evaluate, express, imagine, listen, notice, participate in community, and set goals and be prepared). These habits are thought to create the "broad thinking dispositions" that can help explain music's far-transfer into other non-musical domains (e.g., higher academic achievement in school). This further reinforces the idea that middle and high school in-school music classes are not just about becoming a better musician, but a better, more-complete individual (for oneself and for others) in all aspects of life (Dagaz, 2012).

All in all, amidst all of the social, biological, and physical changes of adolescence, having something that can remain consistent, as well as strengthen important life skills, may be an important protective factor in the transitional period between 8th and 9th grade. Unfortunately, though, some students may not even have the option to continue with music during this transition because the new high school they are attending may not offer music like their middle school did (or vice versa). This no longer makes continuing music an issue of choice, but for this select group of students, an issue of access.

Access to Music

Access identifies which students have the option of taking music, regardless of whether or not they choose to take it. Without accounting for access, student interest in music with no access would ultimately look the same as access with no student interest: non-enrollment. Distinguishing between whether or not a student has access therefore allows researchers to take student interest in enrolling in music into account (especially because these electives are optional). This is of particular interest in the transition

between eighth and ninth grade because students are usually moving between different schools and buildings (Symonds & Galton, 2014), an action that may potentially increase or decrease a student's access to music (Symonds et al., 2017). A student's school zoning could also influence whether or not they are able to select into music in high school, regardless of their desire to do so (Elpus, 2020). Knowing access over time provides a clearer picture of whether less and less students *choose* to enroll in music, or if less and less students are *able* to enroll in music. Being able to disentangle these two concepts is crucial when trying to show evidence of, and ultimately understand, student persistence in music over time.

Concerns in Low-SES Communities

Money and availability of resources is interwoven into the complexity of the retention problem in schools at a multitude of levels. At the individual (family) level, band and orchestra are often considered to be an expensive option for the parents given the cost of instrument rentals/purchases, paid private lessons, uniform fees, transportation to and from after school rehearsals and concerts, travel expenses to competitions or trips, etc. (Kinney, 2010). But families struggling to make ends meet is only a small part of the problem. Today, some claim that fiscal issues at the state and federal level are seriously threatening to make arts education go extinct in the United States (e.g., Kratus, 2007). Funding cuts to the arts have been well-documented over the years, and many districts (disproportionately those in low-income communities) have already gotten rid of their arts programs to cut costs for other more "essential" expenses (Major, 2013).

Improving persistence levels within schools helps provide tangible evidence to policy makers that money being spent on arts programs is being put to good use and not just benefiting the select few that persist. This means that from a strictly economic standpoint, *increasing the demand* for arts education through more students persisting is one way to help *ensure the supply* of money and resources for the arts is not suspended, especially in communities where schools are already struggling financially.

Selection into Music

A student's choice to enroll in music, when they have the access to do so, is known as *selection*. Looking at selection is important because every student is not equally likely to enroll in music during any given year—a variety of factors go into a student choosing to pursue music. Acknowledging and accounting for these different predispositions towards or against music is important, especially when researchers are comparing musicians to non-musicians and looking at music's "effects."

A popular example of this would be finding that music students perform better in academics compared to non-music students. This does not necessarily mean that music *caused* the higher academic outcomes among music students. Another explanation may be that brighter students are *choosing* to enroll in music from the outset (Fitzpatrick, 2006; Kinney, 2008), and that comparing their outcomes may only be highlighting baseline differences between the groups (Elpus, 2013; Kinney, 2010, 2019). Simply, without knowing how each group was different before enrolling in music, it is irresponsible to conclude that music alone explains the disparity in the observed outcomes.

Findings from the selection literature seem to only further illustrate this point. Students who choose to enroll in music and students who do not appear to be two distinctly different populations (with respect to *almost every* measure that has been looked at empirically). Students who choose to enroll in music are more likely to be White, female, and from high socioeconomic backgrounds. Before enrolling in music, these students are more likely to have higher GPA's and test scores. These trends have been displayed across various large-scale datasets for initial enrollment in middle (Alegrado & Winsler, 2020; Kinney 2008, 2010) and high school (Elpus & Abril, 2019; Kinney, 2019) music classes. By these metrics, students who choose to enroll in music classes are already well situated and are likely to perform well in school whether they are in music or not.

These trends also slightly vary when looking at specific music types. For example, choir students do not seem to have higher GPA's and test scores before music enrollment, but band and orchestra students do (Elpus & Abril, 2019; Kinney, 2008, 2010, 2019). Gender differences are more pronounced in choir and orchestra (70% female to 30% male), but almost non-existent in initial enrollments into band (Elpus & Abril, 2019). Alegrado and Winsler (2020) showed that there were no major differences in ethnicity for initial band or choir enrollment, but there was in guitar and orchestra (with Black students being significantly less likely to enroll in both, and Asian students being significantly more likely to enroll in orchestra). These findings highlight the need to not just study music generally, but also to look at different types of music specifically.

Music provides a host of benefits, even though these benefits may be clouded by unequal access and selection into music. No matter the path students take throughout music, their involvement provides them with unique challenges, opportunities, and social connections that play a critical role in the student's overall school experience—even if in currently unknown and indirect ways. But, in order for in-school music participation to even have a chance to impact the lives of children, it must first be sustained over time, which leads me to the topic of persistence.

Persistence within Music

Behind the guise of plentiful research on music's huge popularity in schools and music's non-musical outcomes, there lies another body of literature that is preaching to a different choir: concerned music educators. One of the core calls to action on the issue of student persistence in music (i.e., the "dropout problem") comes from music educators. Unfortunately, empirical evidence supporting this problem is slim. And in addition to the scarcity of persistence evidence, the few studies that do report "persistence" rates only do so in terms of *overall enrollment* in music electives from grade to grade.

The problem is that this conventional way "persistence" has been mentioned (but not specifically researched) does not give insight into the core way (i.e., students enrolled in music the year before now choosing *not* to return the following year) in which overall enrollment numbers drop from year to year. Furthermore, this prior estimate of persistence is ultimately overinflated and systematically suppresses the severity of the "dropout problem." This is because prior estimates are capturing not only students that *truly* persisted in music from one grade to the next, but *also* students that are just joining

music for the first time in that grade. Without a more rigorous and accurate operationalization of persistence, the true—and more alarming—attrition of current music students year by year is unknown.

The few studies that do corroborate the trends of decreasing enrollment from grade to grade (Alegrado & Winsler, 2020; Gouzouasis et al., 2008; Hartley, 1996, 2009; Winsler et al, 2020) rarely seek this trend out as a focal point of their study. This means that much of the evidence for the dropout problem is not even being found, reported, and cited amongst the persistence literature. For example, in a study on the access, selection, and benefits from arts electives in middle school, Winsler et al. (2020) reported that 44% of students that enrolled in an arts elective in 6th grade were no longer enrolled in an arts elective in 7th grade (in a manner that properly captures "true" persistence). This percentage is very illuminating with respects to student persistence, but since it was not the focus of the study, this statistic is unlikely to make its way directly into the persistence literature (thus fueling more unsupported claims from music educators on the severity of the dropout problem). Importantly, because much of the evidence of the dropout problem comes from researchers interested in other research questions, there are few explanations presented (with the numbers to support it) for why student persistence appears to diminish year after year, thus leaving music educators even further in the dark.

Music educators know first-hand the prevalence and severity of the dropout problem and risk it poses to the state of music education (Boyle et al., 1995; Evans et al., 2012; Kratus, 2007; Pergola & Ober, 2012; Williams, 2007, 2011). Most research examining the core causes for dropping out are being conducted by music educators

themselves (Kratus, 2007), allowing for a body of mostly qualitative literature that hits "close to home" and is invested in improving music education from the inside out. In one study, when middle school band directors were asked why students do not persist in band, they cited "lack of commitment to work" as the most common reason for students dropping out (Boyle et al., 1995; Ng & Hartwig, 2011). While there may be validity to this claim, future research understanding why students show this lack of commitment to work (and what specific areas of "work" this commitment is referring to) is key. Without looking into to this issue further, stakeholders could easily assume that students are losing interest in music (which may or may not be true; see Krause et al., 2020), thus further normalizing the existence of the problem. Hearing from the student perspective helps provide much needed clarity, but also helps challenge the notion that the students are most to blame in the situation.

Studies have shown that when peers of middle school students who drop out are asked why their friends are quitting music, they say that they are doing so to make a "conscious effort to avoid music" rather than to explore music through different avenues (Gouzouasis et al., 2008; Lowe, 2012). Music educators should take feedback like this to heart, even if this is not intended to be a direct reflection on the program itself. Between claims of the dropout problem and student reports, it is clear that a further examination into music classes is warranted. While selection gets at music's initial appeal regardless of a student's experience, persistence can begin to be a reflection of one's experience with the music program itself, as well as how one may view themselves as with the identity of "musician" (thus laying a foundation for further examination into the "why" of

student dropouts in music; Evans & McPherson, 2017). The current study will start to chip away at this puzzle by looking beyond just the student's first year with music.

Theoretical Foundations and Gaps in the Literature

Just as music's initial popularity (i.e., first year enrollment) does not accurately reflect music's success and sustainability in schools, the literature on selection into music does not tell the full story either. Gaps in the persistence literature not only involve "what" persistence trends look like (and "how" persistence should be operationalized), but also "who" these *persisters* are most likely to be. There is a need to extend these questions from the selection literature (on the "what" and "who" of initial enrollment) into *continued* musical involvement.

The logic for this extension is fairly straightforward. There are many known predictors for initially self-selecting into a music elective (i.e., selection effects; Elpus & Abril, 2011; Kinney, 2008). Before enrollment, music and non-music students look very different on a variety of demographic, socioeconomic, and achievement metrics (Alegrado & Winsler, 2020; Elpus & Abril, 2019; Kinney, 2019). Just as these predictors show which students are more or less likely to initially select into music, these predictors may (or may not) provide insight into which students are more or less likely to continue to select into music. Put differently, students that are predisposed to sustaining musical involvement may look different, on a variety of metrics, than students who are not.

This logic simply suggests that the "first step" in this line of research should be to see if the predictors of enrollment are in any way related to the *predictors of persistence*. This new approach to research on music persistence (and how it is best operationalized)

could give detailed insight into which students are most at-risk of quitting music *before they even play their first note*, and importantly, will now be in better alignment with music educators' main concern: not just getting students in the door, but *keeping them there*.

Predictors of Persistence

As noted above, the theorized predictors of persistence were largely informed by the selection literature. The main study that specific predictors were pulled from is Alegrado and Winsler (2020), which used the same dataset for their analysis (but for 6th–8th grade instead of 8th–9th grade). Gender, ethnicity, poverty, special education status, English language learner status, cognitive school readiness skills at age 4, 5th grade GPA, and 5th grade standardized test scores were *all* significant predictors of initial middle school enrollment. These predictors were then tested (here) as predictors of persistence into high school.

Because of the exploratory (and novel) nature of this study, a couple of other predictors were also tested. These predictors were either tested but were non-significant in Alegrado and Winsler (2020; i.e., social-emotional and behavior skills at age 4, language and motor skills at age 4), or not-yet-tested predictors of enrollment or persistence (i.e., gifted status, ever being retained in school). More detailed descriptions for all of these predictors can be found below in the measures section.

The Current Study

The current study contributes to the literature by building off the prior work of Winsler et al. (2020) and Alegrado and Winsler (2020). Winsler and colleagues used data

from the Miami School Readiness Project (MSRP), a large-scale longitudinal university-community project involving a low-income—ethnically-minoritized majority—sample of children who received childcare subsidies or attended public school pre-K programs at age four in Miami, Florida and later attended public schools. Winsler et al. (2020) looked at access, selection, and outcomes from any arts electives from 6th through 8th grade (middle school) within a sample of 31,332 students (61% Hispanic, 32% Black, 55% ELL, 81% free/reduced-priced lunch). After controlling for preexisting selection factors (including ELL status, free/reduced-priced lunch status, 5th grade academic performance, and school readiness skills at age 4), arts students (a combination of music, dance, drama, or visual art) had significantly higher middle school GPAs and math and reading scores than non-arts students. Alegrado and Winsler (2020) looked at selection into any music, as well as specific music types, from 6th through 8th grade (middle school) within a sample of 30,413 students (60% Hispanic, 33% Black, 57% ELL, 81% FRL) after controlling for preexisting selection factors (including ELL status, free/reduced-priced lunch status, 5th grade academic performance, and school readiness skills at age 4). Students who were male, had higher cognitive skills at age 4, and had higher 5th grade GPA and test scores were more likely to initially self-select into music electives in middle school (these results also slightly varied when looking at the most widely enrolled-in music types [band, chorus, guitar, and orchestra], the same four music types that are also explored in the current study).

The current study will be the next step in this collection of studies using data from the MSRP. This study will extend on this work in two major ways: 1) this study will

follow students into high school, and 2) this study will specifically look at predictors of persistence of music elective taking from middle school into high school, a critical transition period of interest to music educators (e.g., when high school music educators have to hold recruitment events to attract incoming students from 8th grade; Corenblum & Marshall, 1998; Elpus & Abril, 2019; Evans & McPherson, 2017; Evans et al., 2012; Symonds et al., 2017). The latter point is not only unique for the MSRP dataset, but also for the field at large (especially by utilizing a large, ethnically diverse longitudinal dataset). This will illuminate many of the previously un- or-understudied trends related to persistence in music, specifically during the crucial transition to high school.

Put simply, without understanding the complex mechanisms of the dropout problem, the problem will inevitably continue. The current study—one of the largest to specifically study music persistence—aims to identify a multitude of variables potentially related to certain students choosing to persist or quit at higher rates than others (while using a true operationalization of persistence). By better understanding who is most likely to leave music upon the transition to high school, a more data-driven and targeted approach to the increasing student persistence can be pursued by administrators, educators, and policy makers, alike.

Research Questions and Hypotheses

Research Question 1

How many 8th grade music students stay enrolled in music as they transition into 9th grade? I expect significantly less students will be enrolled in 9th grade vs. 8th grade,

given the dropout problem's core claim—that music enrollment numbers decrease as the student grade level increases (Ng & Hartwig, 2011).

Research Question 2

What are the predictors of any-music persistence from 8th to 9th grade? I expect that many of the predictors (i.e., gender, ethnicity, poverty, special education, English language learner status, prior academic performance [eighth-grade grade point average and standardized reading test scores], and cognitive school readiness skills at age 4) of initial middle school music enrollment found in Alegrado and Winsler (2020) will remain relatively consistent as predictors of persistence into high school, but I anticipate that certain predictors will become more/less important for persistence compared to selection. For example, Kinney (2019) found that poverty status was a significant predictor for initial enrollment in 6th grade, as well as persistence into 8th grade instrumental music, but poverty status no longer significantly predicted persistence into 10th grade instrumental music (unlike most of his other predictors that remained constant from 6th–10th grade). While I do not make a priori hypotheses about any specific predictors that will change during persistence into HS, slight differences are expected.

Research Question 3

Does persistence from 8th to 9th grade look different depending on the type of music enrolled in (band, chorus, orchestra, guitar)? I expect that persistence will look different depending on music type. This is largely guided by literature showing the differences in enrollment patterns for these four most popular music types (Alegrado & Winsler, 2020; Elpus & Abril, 2019), leading me to assume these unique populations of

students will persist differently—and have varied predictors of said persistence—from one another. Notably, the dropout claims are mostly driven by music educators that instruct large instrumental ensembles (that have high initial enrollment rates; Williams, 2007, 2011), suggesting band and orchestra may have a more similar trend (but with likely less persistence), while chorus (a non-instrumental large ensemble) and guitar (an instrumental small ensemble) may have more distinct patterns (but with likely more persistence).

METHOD

Sample

Participants of this study were children from the Miami School Readiness Project (MSRP; Winsler et al., 2008, 2020), a large-scale, prospective longitudinal study that followed five cohorts of children who attended either community-based childcare with subsidies or public school pre-K programs at age 4 between 2002 and 2007 in Miami, Florida. Drawing from the MSRP, the current study's inclusionary criteria involved being enrolled in any music (band, chorus, guitar, orchestra) in 8th grade (which subsequently also meant having end-of-the-year 8th grade GPA data as well). The current study's big *N* was 3,393 8th grade music takers (which represents 11% of the total 8th grade population in the MSRP). These students were enrolled in 8th grade between 2011 and 2016, and all five of the cohorts within the sample reached 9th grade by the 2017–2018 academic year (when data collection stopped). The current study's students were 52% male with the racial-ethnic makeup of 62% Hispanic, 29% Black, 8% White, and 1% Asian/Pacific Islander. Most students were in poverty (77% received FRL in eighth grade), 11% had previously been retained, and 10% of the students received special education services in eighth grade (not including a separate 22% that had previously been designated as gifted). In kindergarten, 58% were initially categorized as English language learners (ELLs). It is important to note that while previous research from our lab (i.e., Alegrado & Winsler,

2020; Winsler et al., 2020) has explored differences in *access* in arts courses in middle school, almost all schools in Miami-Dade County (~98%) offer music classes in high school. This means *access*, which is important for persistence researchers to explore before reporting persistence rates, is *not* a problem in the current study's sample and will therefore not be addressed in any future results or analyses.

Procedure

School readiness was measured directly during each cohort's pre-K year by well-trained outside assessors or the student's pre-K teacher, and parents and teachers both reported on the child with the survey instruments described below (Crane et al., 2011; Winsler et al., 2008, 2020). School system student records were collected for each child from kindergarten through ninth grade. Administrative school records of student demographic information (e.g., gender, ethnicity) were collected with consent and then properly deidentified, as approved by the institutions' institutional review board.

Measures

Demographic Characteristics

Gender

Gender was acquired from school record data (male = "1," female = "0").

Ethnicity

Ethnicity/race was acquired from school record data. In any music analyses, children are categorized into four ethnic-racial groups: Hispanic, Black, White/Other, and Asian/Pacific Islander. In music-type-specific analyses, these categories are instead collapsed into three groups (combining Asian/Pacific Islander into White/Other because

of low *n*'s in specific music types). Dummy codes were created to run separate models for different reference groups.

ELL Status in Kindergarten

ELL status was determined from parent-reported home language at kindergarten entry. Children who predominantly spoke another language at home were considered ELLs (dummy coded as "1" versus "0") by the school district if in kindergarten they did not show proficiency on the Miami-Dade County Oral Language Proficiency Scale–Revised (Abella et al., 2005). All ELL students were fully proficient in English by 8th grade.

Disability Status in 8th Grade

Students were coded according to their primary exceptionality in 8th grade. Codes included: intellectual disability, speech/language disorder, visually impaired, deaf or hard of hearing, specific learning disabled, dual-sensory impaired, autistic, severely emotionally disturbed, traumatic brain injured, or other health impaired. If a student had at least one of these codes in 8th grade, they were coded with a "1" (all others, including gifted students, were coded with a "0").

Poverty Status in 8th Grade

Free/reduced-priced lunch (FRL) status in 8th grade served as a proxy for poverty status. Students from low-income families were eligible for free (130% of the Federal Poverty Line) or reduced-price lunch (185% of the Federal Poverty Line). Students who received free or reduced-price lunch were coded as "1" and students who received no special lunch were coded as "0."

School Readiness Assessments

Social-Emotional and Behavior Skills in Pre-K

Children's social skills and behavior problems were measured at age 4 using the Devereux Early Childhood Assessment (DECA; LeBuffe & Naglieri, 1999). This assessment uses parent and teacher reports to measure children's social-emotional and behavioral skills at two time points, at the beginning (i.e., fall; T1) and end (i.e., spring; T2) of each student's pre-K year. Forms were available in Spanish or English. The DECA is comprised of four total subscales, each measured on a 5-point Likert scale from "never" to "very frequently:" initiative, attachment, and self-control (combined to measure social-emotional skills; α = .94), and behavior concerns (to measures behavioral skills; α's = .81–.94; Crane et al., 2011). National percentile scores are reported (from T2 if available, T1 if not) to increase interpretability.

Cognitive, Language, and Motor Skills in Pre-K

Accomplishment Profile-Diagnostic (LAP-D; Nehring et al., 1992) is a norm-referenced, standardized assessment which uses teacher and bilingual assessors to measure children's development of cognitive, language, and gross-and-fine motor skills at the same two time points listed above. Assessments were administered in the child's strongest language, either Spanish or English. The LAP-D is comprised of four scales, each containing two subscales: cognitive (counting, matching), language (comprehension, naming), fine motor (writing, manipulation), and gross motor (body, object; α's = .93–.95; Winsler et al., 2008). Age-standardized national percentile scores are reported (from T2 if available, T1 if not) to increase interpretability.

Academic Achievement

Gifted Status

Students with the primary exceptionality of "gifted" in at any time between Kindergarten and 8th grade were coded as "1," while all others were coded as "0." Gifted students likely, but not necessarily, received some type of service from their school that was exclusive to gifted students.

Retention in Elementary or Middle School

A composite variable for students that were ever retained (coded "1") in elementary or middle school was created (not retained = "0").

GPA in 8th Grade

GPA is the average of grades each student received from all of their subjects in 8th grade. GPA was on a 5-point A-to-F scale (i.e., 5.0 = A, 4.0 = B, 3.0 = C, etc.).

Standardized Math and Reading Scores in 8th Grade

Students were required to take state-wide, high-stakes math and reading assessments, called the Florida Comprehensive Achievement Test 2.0 (FCAT 2.0). Questions were in both multiple-choice and short-answer formats. Ordinal proficiency scores ranged from 1–5, with 5 being the highest and a 3 indicating performing at grade level. During the time of our data collection (Spring 2015), the Florida Standards Assessment (FSA) replaced the FCAT 2.0 but still retained the same categorical scoring system (Florida Department of Education, 2016). This only impacted one cohort in our sample (cohort E). For student who don't have an 8th grade test for some reason, their 7th grade standardized tests scores was used instead.

Music Persistence from Middle to High School

Administrative data received each academic year, for each student for all grade levels, included a list of all course subjects taken by each student (i.e., math, social studies, science, band) with an end-of-the-year teacher-assigned grade for each course. Music courses are not required in Miami Dade County and are offered as electives. Using administrative data, variables were created that denoted whether (i.e., yes = "1," no = "0"), when (e.g., 8th grade), and which (by type, e.g., chorus, or generally, i.e., any music) music courses students took in each grade of middle school and high school. To ensure a conservative estimate of students in music electives, students also had to have concurrent end-of-the-year GPA data as evidence that they were present during the entirety of the year they took music. These detailed variables could then be used to flag persistence.

To denote any-music persistence from 8th to 9th grade (persist = "1"), students had to be enrolled in any music elective (i.e., band, chorus, orchestra, or guitar) in 8th grade *and* also enrolled in any music elective in 9th grade (an important operationalization to note for the current study). Students enrolled in any music in 8th grade, but not in 9th grade were coded as did not persist (not persist = "0"). It is important to note that students that "did not persist" (i.e., had music in 8th, but not 9th grade) still had to have data (i.e., "be around") in 9th grade to be considered a "0" for persistence. This procedure was also repeated for each of the four largest music types (i.e., band, orchestra, guitar, chorus; following previous literature, e.g., Alegrado & Winsler, 2020). Students who switch music course types from 8th to 9th grade (say, from taking orchestra in 8th grade to taking band in 9th grade) were coded as continuing music for the *any-music* persistence variable

(i.e., "1"), but coded as quitting for the *individual music type* persistence variable (i.e., "0") that corresponds with the 8th grade music form they switched out of (e.g., quitting orchestra from 8th grade to 9th grade).

If a student was enrolled in *more than one* music type in 8th grade, this student was included in the persistence variable for *both* individual music types that they persisted in (marked as either a "0" or a "1" accordingly, depending on which—if any—music type[s] that student was enrolled in during 9th grade). This means that *individual music type* persistence variables were only concerned with a student's persistence *within* that music type—it did not matter what other, if any, music classes a student was also taking or persisting in. The *any-music* persistence variable was only concerned with whether a student persisted from any music (regardless of type) to any music (regardless of type) *at least once* (regardless of if this happened more than one time).

One later analysis in this thesis aimed to see how *any-music* persistence (from 8th to 9th grade; rates and predictors) may be contingent on what music type a student was enrolled in during 8th grade. This is only being noted here because students in *more than one* music type in 8th grade were handled *differently* here. In the final multigroup analysis (described later), students in *more than one* music type in 8th grade were split into their own unique group, making a 5-level distinction between 8th grade music types (e.g., *only* band, *only* chorus, *only* guitar, *only* orchestra, and *more than one* music type). This does not change anything discussed above for the creation of the *persistence* variables, but just specifies that in one model, students in *more than one* 8th grade music type were handled as a separate group when compared to how they persisted within the *any-music*

persistence variable. Also, on one final (and different) point, because almost all high schools in Miami-Dade County (~99%) offered the four most popular music classes explored in this study (band, chorus, guitar, and orchestra), access did not need to be accounted for in variable creation or analyses.

Missing Data

First, I report the percentage of missingness for each of my predictor variables (see Table 1)—"missingness" on predictors means that data were not collected on that specific variable for that student. Next, I systematically test whether those who are missing data are different from those who are not. Then, I ran all of my major regression analyses in Mplus. This allowed me to use Mplus' FIML (full information maximum likelihood) function, which handles missing at random (MAR) data exceptionally well (especially when compared to SPSS's default of using listwise deletion).

If any of my dependent variables (i.e., any-music persistence, band persistence, chorus persistence, guitar persistence, and orchestra persistence—all used as separate D.V.'s from model to model) had missing data, this meant something different—"missingness" on the any-music persistence variable meant that the student did not show up to the school system in 9th grade (and for specific music type variables, missing data codes were also used to denote if a student was not enrolled in that specific music type in 8th grade; e.g., to ensure that band persisters ["1"] are compared to only band quitters ["0"], and not everyone else in the sample that was not a band persister but showed up in 9th grade). This rigorous operationalization of missingness within each persistence variable (D.V.) is what allows for persisters to be compared to their correct

counterfactual—non-persisters (either generally within any-music, or specifically within each music type).

For example, for the any-music persistence variable, a very small minority of students (*n* = 191) were "missing" on this dependent variable. That means they were in music in 8th grade, but did *not* have any data at all in 9th grade. These students may have transferred to a school outside of Miami Dade county or dropped out, but these students were *not* categorized as non-persisters or persisters. Non-persisters ("0"'s on the persistence variables) needed to not be enrolled in music in 9th grade *and* needed to have data in 9th grade (i.e., "be around"). Cases that were not around in 9th grade did not differ systematically from cases that were around in 9th grade. Missing cases on all persistence (i.e., dependent) variables are *not* included in any subsequent (e.g., by music type) analyses (and are not accounted for in Mplus' FIML, making all *n*'s and counterfactuals for music persistence accurate from analysis to analysis).

Analytic Plan

All quantitative data were analyzed with advanced multivariate inferential statistical techniques using Mplus (for all multivariate analyses—utilizing FIML) and SPSS (for all bivariate and descriptive analyses) to examine important predictors associated with persisting in music electives in the transition between middle and high school (8th to 9th grade).

RQ 1: How many 8th grade music students stay enrolled in music as they transition into 9th grade?

This first question was answered through descriptive statistics. Primarily frequencies were used to analyze the number of students that persist within music electives (using the general *any music* aggregate music persistence variable and then each individual music type) from 8th to 9th grade.

RQ 2: What are the predictors of any-music persistence from 8th to 9th grade?

This second question was answered through a hierarchical logistic regression. Logistic regression was used to explore how each theorized predictor (i.e., gender, ethnicity, ELL status, disability status, poverty status, preschool social-emotional and behavior skills, cognitive, language, and motor skills, GPA, standardized test scores, ever being gifted, and ever being retained) impacts a student's choice to persist, or quit, from in-school music electives from 8th to 9th grade. Demographic characteristics, pre-K school readiness assessments, and later academic achievement were entered in steps (in the order just described), allowing for prior steps (i.e., demographic variables) to be controlled for in a developmentally informative hierarchical framework (allowing for subsequent substantive variables [e.g., GPA] to be interpreted above and beyond initial background variables [e.g., gender]).

RQ 3: Does persistence from 8th to 9th grade look different depending on the type of music enrolled in (band, chorus, orchestra, guitar)?

This third question was answered in two ways: 1) through multiple logistic regressions, each run separately to look at *persistence within each music type* (addressing

the "look different" phrasing), and 2) by a multigroup analysis, run individually to look at *persistence within any-music* (like RQ2), but this time to investigate how the type of music a student was enrolled in during 8th grade (used as a 5-level grouping variable; only band, only chorus, only guitar, only orchestra, and more than one music type) moderates predictors of any-music persistence (addressing the "depending" phrasing). The first analytic strategy was used gather informative information only *within each* music type (e.g., "what does persistence/predictors of persistence look like when I *only* look at students persisting in band, ignoring all other students/music types?")—comparisons across music types *cannot* be drawn (because these are separate models/populations/developmental contexts). The second analytic strategy was used to gather informative information about any-music persistence, but now with the ability to disentangle how these results may differ *as a function of* the 8th grade music type the student was in (e.g., "how do predictors of any-music persistence *change* when taking into account the music type a student was in during 8th grade [or if they were in more than one]?")—comparisons across music types *can* be drawn (because this is all taking place within one model that can create nested "group-specific" models that allow for differences between populations/developmental contexts of interest to be intentionally explored).

Taken together, the first analytic strategy can be thought of as re-running RQ2, but now with separate *D.V.'s* for each music type (creating four separate music-type-specific persistence models for each music type). Like RQ2, bivariate relationships were explored first, and then similar multiple regression models were run separately for band,

chorus, guitar, and orchestra. The second analytic strategy can be thought of as re-running RQ2 (with the same any-music persistence D.V.), but now with a new *grouping variable* that represents a student's 8th grade music type (creating a single any-music persistence model that allows for *direct comparisons* to be made and statistically tested between each 8th grade music type—with four groups representing *exclusive* membership in each of the 8th grade music groups, and a unique *fifth group* representing a student that was enrolled in *more than one* 8th grade music type). Unlike the first analytic strategy, this approach allowed for direct comparisons to be drawn between each music type, helping to see if 8th grade music type, itself (or, interestingly, if being in *more than one music type*), moderates predictors of any-music persistence into 9th grade.

RESULTS

RQ 1: How many 8th grade music students stay enrolled in music as they transition into 9th grade?

Any Music

Table 2 shows that out of the 3,202 8th grade music takers (with data in 9th grade, like all other *n*'s below), 784 (24.5%) of them persisted with any-music enrollment into 9th grade. This means that the other three-quarters (*n* = 2,418) of 8th grade music takers quit music during the transition to 9th grade.

Within Music Types

Table 2 shows that out of the 1,923 8th grade band takers, 392 (20.4%) of them persisted within band into 9th grade. Out of the 593 8th grade chorus takers, 129 (21.8%) of them persisted within chorus into 9th grade. Out of the 341 8th grade guitar takers, 42 (12.3%) of them persisted within guitar into 9th grade. Out of the 486 8th grade orchestra takers, 99 (20.4%) of them persisted within orchestra into 9th grade. An extremely small number of the above students (*n* = 6) persisted in two music types simultaneously from 8th to 9th grade (giving students with more than one music type in 8th grade a 7.4% *dual persistence rate* out of the *n* = 81 students with more than one music type in 8th grade). Within the 81 students (that are also above) who took more than one music type in 8th grade, 30.9% of them persisted in at least *one* any-music elective in 9th grade (giving this

"pseudo-group," that will not be exclusively analyzed until the multigroup analyses in RQ3, the highest chance of persisting given their higher number of prior 8th grade experiences they have to choose from). Another group of students (*n* = 128) are considered persisters in any music overall, but quitters when looking only within specific music types (i.e., these students are "switching persisters;" e.g., they could have taken band in 8th grade and then chorus in 9th grade, meaning they would be a quitter in band specifically but a persister in music generally). Overall, Table 2 shows chorus had the highest rate of persistence from 8th to 9th grade out of the four music types. Behind chorus, band and orchestra had similar persistence rates with approximately 1 in 5 students persisting. The lowest rate of persistence was displayed in guitar with approximately 1 in 8 students persisting. Being in more than one music type was, unsurprisingly, associated with having an even higher chance of persisting in at least one musical elective when transitioning into high school.

RQ 2: What are the predictors of any-music persistence from 8th to 9th grade?

Any Music

Bivariate Analyses

Bivariate analyses were conducted first to see how each predictor (by itself) was associated with persistence in any music from 8th to 9th grade. Chi-square analyses were used to examine categorical predictors and *t*-tests were used to examine continuous predictors. Table 3 shows how categorical variables (gender, ethnicity, ELL status, disability status, poverty status, ever gifted, and ever retained) differed depending on whether the student persisted with any music from 8th to 9th grade. There were ethnic

differences related to any-music persistence, $\chi^2(3) = 13.71$, $p < .01$. White students were most likely to persist (28.7%), followed by Hispanic students (25.9%). Black students (20.2%) and Asian students (20.0%) were least likely to persist in any music. ELL status was also associated with any-music persistence, $\chi^2(1) = 9.05$, $p < .01$. Former ELL's were more likely to persist (26.4%) compared to native English speakers (21.7%). Outside of differences in ethnicity and ELL status, all other categorical predictors (gender, disability status, poverty status, ever gifted, and ever retained) were not related to any-music persistence on a bivariate level (*p*'s > .05; see Table 3).

Table 4 shows how continuous variables (social skills, behavior problems, cognitive, language, motor skills at school entry, GPA and standardized math and reading scores in 8th grade) differed depending on whether the student persisted with any music from 8th to 9th grade. Students who persisted in any music had higher prior 8th grade GPA's ($t(1421.77) = –4.63$, $p < .001$, $d = .19$), higher 8th grade standardized reading scores ($t(1127.32) = –4.89$, $p < .001$, $d = .22$), and higher 8th grade standardized math scores ($t(570.03) = –5.26$, $p < .001$, $d = .32$), compared to students who did not persist in any music from 8th to 9th grade (*M*'s 4.05 vs. 3.94, 3.39 vs. 3.14, and 2.92 vs. 2.55 respectively). Equal variances were not assumed for GPA, reading, and math scores. While 8th grade academic performance variables were significantly different between any music persisters and non-persisters, none of the pre-K school readiness variables showed this trend (*p*'s > .05).

It is important to note that school readiness assessments at age 4 not only were not bivariately related to any-music persistence, but they also were *never* related to

persistence within any of the four specific music types either (band, chorus, guitar, orchestra). The lack of any bivariate relationship between school readiness assessments—that were collected 10 years prior to each student's transition to 9th grade—and any of the music persistence variables (overall or by music type), coupled with the high rates of missingness on each of these variables (between ~15–45%; see Table 1), has led school readiness assessments to *not* be included in subsequent multivariate analyses (for any music or music types).

Multivariate Analyses

The results described from the above analyses were conducted variable by variable bivariately—without taking into account how all of the other predictors also related to persistence. Here I report the results of a developmentally informative, hierarchical, two-step logistic regression analysis that predict any-music persistence from 8th to 9th grade (did persist = 1, did not persist = 0). This multivariate analysis controls for the intercorrelations between all of the predictors and, importantly, allow me to see how each predictor contributes to persistence *above and beyond* all of the other predictors. All multivariate models described below were run in Mplus to utilize FIML when encountering missing data.

Step 1 includes demographic variables and background child characteristics (gender, ethnicity, ELL status, disability status, and poverty status), and Step 2 includes later academic achievement measures (gifted status, retained status, 8th grade GPA, and 8th grade standardized reading and math scores). Step 2 shows the relationship between any-music persistence and later academic achievement, controlling for demographic

variables entered in Step 1. Step 2 also shows whether the demographic variables remain associated with any-music persistence after factoring in later academic achievement. Therefore, any association established in Step 1 that ceases to be significant in Step 2 is better explained by academic achievement rather than demographics.

Separate models were run with FCAT reading and FCAT math to avoid any possible multicollinearity (r = .58), and to follow previous research within the MSRP (see Alegrado & Winsler, 2020; Winsler et al., 2020). An additional model was also run to analyze the fourth ethnicity contrast (Black/Hispanic), that flips the reference group from White to Hispanic.

Step 1

Table 5 shows the results of the logistic regression predicting any-music persistence from 8th to 9th grade. When only demographic variables are entered in the first step, ethnicity is the only unique significant predictor of persistence (with ELL status trending towards significance). Odds ratios (ORs) are provided in Table 5 (and below) to denote the degree to which the odds of persisting in any music elective from 8th to 9th grade increase (greater than "1") or decrease (less than "1") as a function of being one level of a categorical predictor (i.e., retained) compared to the other (i.e., not retained). ORs for continuous variables signify how much the odds of persisting increases or decreases with a 1-point increase in the predictor (e.g., moving from a "C" to a "B" in overall 8th grade GPA).

Black students had 31% fewer odds of persisting in any music from 8th to 9th grade compared to White students, but Black students did not have significantly different

odds of persisting when compared to Hispanic students. While this was the only significant predictor of any-music persistence in Step 1, there appeared to be a trend toward students that were former ELL's having increased odds of persisting compared to their native English-speaking peers (p = .058).

Step 2

Step 2 now enters prior academic achievement variables into the model while controlling for the demographic variables entered in Step 1. GPA and standardized reading and math scores in 8th grade were all significantly and positively associated with persisting with any music elective from 8th to 9th grade (while ever gifted and ever retained were not significantly related to any-music persistence). A 1-point increase in 8th grade GPA (moving up one letter grade) was associated with 19% greater odds of persisting in any music elective. For 8th grade standardized test scores, a 1-point increase in reading (going from a score of 3 out of 5 to a score of 4 out of 5) was associated with 15% greater odds and a 1-point increase in math was associated with 28% greater odds of persisting with any music electives into high school.

When academic achievement variables were entered, the prior difference related to ethnicity (i.e., Black students having decreased odds of persisting) disappeared, and disability status became significant. Only after controlling for academic achievement, students with disabilities had 36% greater odds of persisting within any music compared to their peers who have not reported any disabilities. In addition, the trend favoring ELL students continues (albeit less strongly), but nevertheless remains insignificant when academic achievement was accounted for (p = .078). This means that when all variables

were entered into the model in Step 2, only 8th grade GPA, reading, math, and disability status were significantly and positively associated with any-music persistence from 8th to 9th grade (see Table 5).

RQ 3: Does persistence from 8th to 9th grade look different depending on the type of music enrolled in (band, chorus, orchestra, guitar)?

Within Music Types

This research question was answered in two ways. First (here; see Table 6), similar logistic regression models that were run above for any-music persistence were also run separately to predict persistence *only within* each music type (i.e., 8th grade band to 9th grade band, 8th grade chorus to 9th grade chorus, etc. using those unique music-specific D.V.'s). This allows for a rough estimate for how the persistence rates (RQ1) and predictors (RQ2) shown within any music *look different* when the dependent (persistence) variable is specifically coded to track persistence within only a single music type (instead of an aggregate of any music types together). Each model does *not* have completely independent membership, and may have some overlap, which is a big reason why direct comparisons should not be made here (i.e., some students may be enrolled in multiple music types in 8th grade, regardless of whether they persist or not). Later (below), a multigroup model was run to explore—and more directly compare—how persistence within *any* music into 9th grade may *depend*, or be moderated by, the specific music-type a student was exclusively enrolled in during 8th grade (as completely independent groups, within one model, that will additionally allow for the distinct exploration of students enrolled in *multiple* music types in 8th grade).

But first, results from preliminary bivariate tests and separate multivariate regression analyses predicting band, chorus, guitar, and orchestra persistence are reported here. Notable deviations seen in Step 2 of these music-type-specific persistence models, compared to what was observed in Step 2 of the any-music persistence model, will also be highlighted below. It is important to note that Asian students had to be combined with White/Other students in these music specific analyses below because of low *n*'s for Asians in some of the music types (creating a 3-level, instead of a 4-level, ethnicity variable of White/Other, Hispanic, and Black). Also, pre-K school readiness scores are still not included in any of the multivariate models below (just like the any music analyses) because of the lack of relationship between any of the persistence variables bivariately and the high levels of missingness (15–45%; see Table 1). Separate models were run to explore FCAT reading and FCAT math, as well as to analyze the third ethnicity contrast (Black/Hispanic), that flips the reference group from White/Other (now including Asian) to Hispanic. FIML in Mplus is still utilized to handle all missing data encountered for predictors entered in all of the multivariate models below.

Band

First, results from bivariate associations related to band persistence are discussed. Table 7 shows how categorical variables (gender, ethnicity, ELL status, disability status, poverty status, ever gifted, and ever retained) differed depending on whether the student persisted or not within band from 8th to 9th grade. Chi-square analyses show that gender ($\chi^2(1) = 4.71$, $p < .05$) and ethnicity ($\chi^2(2) = 13.71$, $p < .01$) were significantly related to persisting in band from 8th to 9th grade. Male students persist at higher rates (22.0%) than

female students (17.9%), and Black students persisted at lower rates (16.8%) than Whites/Others (including Asians; 25.2%) and Hispanics (21.6%) in band. No other categorical predictors were related to band persistence at the bivariate level (*p*'s > .05). Table 8 shows how continuous variables (social skills, behavior problems, cognitive, language, motor skills at school entry, GPA and standardized math and reading scores in 8th grade) differed depending on whether the student persisted or not with band from 8th to 9th grade. Students who persisted in band had higher 8th grade GPA's ($t(651.88) = -4.84$, $p < .001$, $d = .27$), higher 8th grade standardized reading scores ($t(532.01) = -4.20$, $p < .001$, $d = .26$), and higher 8th grade standardized math scores ($t(894) = -5.37$, $p < .001$, $d = .45$), compared to students who did not persist in band from 8th to 9th grade (*M*'s 4.01 vs. 3.84, 3.32 vs. 3.02, and 2.92 vs. 2.42 respectively), but were not significantly different on any of the school readiness assessments collected at age 4 (*p*'s > .05).

Next, results from hierarchical, two-step logistic regression models (exactly like those run for any-music persistence, except with a 3-level, not a 4-level, ethnicity variable) that specifically predict *band* persistence from 8th to 9th grade (among 8th grade band-takers) are reported here. Table 9 shows that none of the demographic variables were significant when entered in Step 1 (other than the Black/White and gender contrasts trending significant; *p*'s > .05), but gender (male students having increased odds of persisting over female students) becomes significant after academic achievement variables are entered into the model in Step 2. Step 2 also shows that 8th grade GPA and 8th grade standardized math scores are significantly and positively related to band persistence over and above any of the previously entered demographic variables (and 8th

grade standardized reading also trends in this direction; $p > .05$). When looking at ORs, this means that male students—compared to female students—had 39% greater odds of persisting, a 1-point increase in 8th grade GPA was related to 51% greater odds of persisting, and a 1-point increase in 8th grade standardized math was related to 41% greater odds of persisting in band.

As Table 6 shows, 8th grade GPA and standardized math scores predict any-music persistence, as well as band-specific persistence. But 8th to 9th grade band persistence is better predicted by gender, and not disability status or reading scores (as reported in any-music persistence). A more direct comparison (within one model) of how music types moderate *any-music persistence* are explored below in the multigroup analysis, but the above deviations give a glimpse into the unique ways that *band persistence* differentiates itself from any-music persistence (albeit these specific comparisons are being drawn from two different models involving slightly different, but overlapping, populations—i.e., 8th grade band-takers vs. 8th grade music-takers—and should be interpreted with caution).

Chorus

Bivariate results are discussed first. Table 10 shows how categorical variables differed depending on whether the student persisted or not within chorus from 8th to 9th grade. Chi-square analyses show that gender ($\chi^2(1) = 4.92$, $p < .05$), ethnicity ($\chi^2(2) = 10.55$, $p < .01$), ELL status ($\chi^2(1) = 7.72$, $p < .01$), poverty status ($\chi^2(1) = 9.35$, $p < .01$), and gifted status ($\chi^2(1) = 12.68$, $p < .001$) were all significantly related to persisting in chorus from 8th to 9th grade. In chorus, female students persist more (23.5%) than male students (13.6%), Black students persist least (14.7%) and Hispanic students persist the

most (26.5%), ELL students persist more (26.4%) than non-ELL students (17.0%), students who do not receive free/reduced-priced lunch persist much more likely (30.5%) than students who receive free/reduced-priced lunch (18.6%), and students who classified as gifted persist significantly more (33.6%) than their never gifted peers (18.7%). The other categorical predictors of disability status and prior retention status were not related to chorus persistence at the bivariate level (*p*'s > .05). Table 11 shows how continuous variables differed depending on whether the student persisted or not with chorus from 8th to 9th grade. Students who persisted in chorus had higher 8th grade GPA's ($t(591) = -2.21$, $p < .05$, $d = .23$), higher 8th grade standardized reading scores ($t(466) = -2.23$, $p < .05$, $d = .26$), and higher 8th grade standardized math scores ($t(305) = -3.27$, $p < .01$, $d = .46$), compared to students who did not persist in chorus from 8th to 9th grade (*M*'s 4.12 vs. 3.99, 3.36 vs. 3.08, and 2.91 vs. 2.43 respectively), but were not significantly different on any school readiness assessments collected at age 4 (*p*'s > .05).

Next, results from hierarchical, two-step logistic regression models (like those run for any-music persistence) that specifically predict *chorus* persistence from 8th to 9th grade (among 8th grade chorus-takers) are reported here. Table 12 shows that only not receiving free/reduced-priced lunch is a significant predictor of persistence when just Step 1 variables are entered (other than female trending significant; $p > .05$). Not being in poverty remains a significant predictor after academic achievement variables are entered into the model in Step 2, but Step 2 also reveals that gifted status and 8th grade math scores are significantly and positively related to chorus persistence over and above any of the previously entered demographic variables (and being female also trends towards

significance; $p > .05$). When looking at ORs, students who receive free/reduced-priced lunch—compared to students that do not—are half as likely to persist, students who were gifted—compared to students who were not—have more than twice the odds to persist, and a 1-point increase in 8th grade math is related to 33% greater odds to persist in chorus.

As Table 6 shows, standardized math scores predict any-music persistence, as well as chorus-specific persistence. But 8th to 9th grade chorus persistence is better predicted by poverty status and gifted status, and not disability status, GPA, or reading scores (as reported in any-music persistence). A more direct comparison (within one model) of how music types moderate *any-music persistence* is explored in the later multigroup analysis, but the above deviations give a glimpse into the unique ways that *chorus persistence* differentiates itself from any-music persistence (albeit these specific comparisons are being drawn from two different models involving slightly different, but overlapping, populations—i.e., 8th grade chorus-takers vs. 8th grade music-takers).

Guitar

First, bivariate results are discussed. Table 13 shows how categorical variables differed depending on whether the student persisted or not within guitar from 8th to 9th grade. Chi-square analyses show that gender ($\chi^2(1) = 6.43$, $p < .05$) was the only predictor significantly related to persisting in guitar from 8th to 9th grade. Male students were much more likely to persist in guitar (15.6%) than female students (6.0%). All other categorical predictors (ethnicity, ELL status, disability status, poverty status, ever gifted, and ever retained) were not related to guitar persistence at the bivariate level (p's > .05). Table 14

shows how continuous variables were associated with student persistence in guitar from 8th to 9th grade. None of these continuous variables (social skills, behavior problems, cognitive, language, motor skills at school entry, GPA and math and reading scores in 8th grade) were significant at the bivariate level (*p*'s > .05).

Next, results from hierarchical, two-step logistic regression models that specifically predict *guitar* persistence from 8th to 9th grade (among 8th grade guitar-takers) are reported here. Table 15 shows that only being a male is a significant predictor when just Step-1 demographic variables are entered, and that being a male remains a significant predictor after academic achievement variables are entered into the model in Step 2. None of the academic achievement variables entered in Step 2 ever became significant (*p*'s > .05). The ORs tell me that once all predictors have been accounted for in the model, male students still have a prominent, more than 2-fold, increased odds of persisting in guitar from 8th to 9th grade compared to their female counterparts over and above all other predictors.

As Table 6 shows, none of the variables that predict any-music persistence predicted guitar-specific persistence. It appears that 8th to 9th grade guitar persistence is better predicted by only gender, and not disability status, GPA, or reading or math scores (as reported in any-music persistence). A more direct comparison (within one model) of how music types moderate *any-music persistence* is explored in the later multigroup analysis, but the above deviations give a glimpse into the unique ways that *guitar persistence* differentiates itself from any-music persistence (albeit these specific comparisons are being drawn from two different models involving slightly different, but

overlapping, populations). It should also be noted that the guitar-specific regression models had the smallest total *n* of any of the models (*n* = 341 8th guitar-takers), as well as the smallest *n* of persisters (*n* = 42 8th to 9th grade guitar persisters).

Orchestra

Results from bivariate analyses are discussed first. Table 16 shows how categorical variables differed depending on whether the student persisted or not within orchestra from 8th to 9th grade. Chi-square analyses show that ELL status ($\chi^2(1) = 4.09$, $p < .05$) was the only predictor significantly related to persisting in orchestra from 8th to 9th grade. Those that predominately spoke a home language other than English in kindergarten (ELL's) persisted in orchestra at significantly higher rates (23.2%) than those whose predominant home language was English in kindergarten (non-ELL's; 15.6%). All other categorical predictors (gender, ethnicity, disability status, poverty status, ever gifted, and ever retained) were not related to orchestra persistence at the bivariate level (*p*'s > .05). Table 17 shows how continuous variables were related to student persistence in orchestra from 8th to 9th grade. None of these continuous variables (social skills, behavior problems, cognitive, language, motor skills at school entry, GPA and math and reading scores in 8th grade) were significant at the bivariate level (*p*'s > .05).

Next, results from hierarchical, two-step logistic regression models that specifically predict *orchestra* persistence from 8th to 9th grade (among 8th grade orchestra-takers) are reported. Table 18 shows that only being a former ELL is a significant predictor when just Step-1 demographic variables are entered (other than the

Hispanic/White contrast trending toward significance, *p*'s > .05), and that former ELL status remains the only significant predictor (and the Hispanic/White contrast remains the only trending predictor, *p*'s > .05) after academic achievement variables are entered into the model in Step 2. None of the academic achievement variables entered in Step 2 ever became significant (*p*'s > .05). Interpreting the ORs tells me that once all predictors have been accounted for in the model, former ELL's still have a notable 137% increased odds of persisting in orchestra from 8th to 9th grade compared to their non-ELL counterparts.

As Table 6 shows, none of the variables that predict any-music persistence also predict orchestra-specific persistence (although ELL status does trend towards significance in the any music model). This means that 8th to 9th grade orchestra persistence is better predicted by only former ELL status, and not disability status, GPA, or reading or math scores. A more direct comparison (within one model) of how music types moderate *any-music persistence* is explored in the later multigroup analysis, but the above deviations give a glimpse into the unique ways that *orchestra persistence* differentiates itself from any-music persistence (albeit these specific comparisons are being drawn from two different populations—i.e., 8th grade orchestra-takers vs. 8th grade music-takers).

Multigroup Comparative Analyses

Finally, a multigroup analysis was run to examine if the relationship between *any*-music persistence into 9th grade and each predictor varied as a function of the music type the student was enrolled in during 8th grade. This analysis allows me to see if the results found for any-music persistence into 9th grade (i.e., RQ2) are generalizable to all 8th grade

music-takers, regardless of the 8th grade music type the student was enrolled in. Importantly, this model allows me to *directly test*—one-by-one—if there are statistically significant differences between music types (and unique to this analysis, *being in more than one music type* in 8th grade [the fifth group, $n = 81$]) with respect to each predictor's effect on any-music persistence. Until now, students in this "fifth group" have just fallen into whatever music types they were enrolled in. Now, these students taking more than one music type can be explored as the unique population that they are.

This multigroup analysis used the same logistic regression model that was run for RQ2 (with the same D.V., predicting *any-music* persistence), but added 8th grade music type as a grouping variable. This grouping variable for 8th grade music type was composed of five unique groups: band only ($n = 1{,}890$), chorus only ($n = 575$), guitar only ($n = 329$), orchestra only ($n = 458$), and more than one music type ($n = 81$). Students only enrolled in a single music type in 8th grade were assigned the group for that music type, but any student taking more than one music type in 8th grade were assigned to the multiple music types group (and would not fall into any of the specific music type groups). Each group has completely independent membership and no overlap.

To analyze this multigroup regression, nested model comparisons—that were tested using chi-square difference tests—examined how a less-constrained model compared to a more-constrained model. A significant chi-square difference test indicates that the less-constrained model fit significantly better than the more-constrained model. A less-constrained model (e.g., that lets the effect of a predictor be allowed to vary across groups) fitting better suggests there are significant differences based on the grouping

variable (i.e., 8th grade music type). Inversely, this means that a non-significant chi-square difference test signifies that the associations among the predictors were similar across groups. To report overall model fit for the full models (using actual chi-square for model fit and the root-mean-square error of approximation [RMSEA]; RMSEA is an absolute fit index, meaning that it assesses how far a hypothesized model is from a perfect model), a RMSEA less than or equal to .05 indicated good (acceptable) fit.

Once full models were tested (that freed or constrained all predictors at once), this difference-testing approach was then applied to one path (predictor) at a time (until all predictors had been individually tested) to examine *which* predictors significantly varied across *which* groups (i.e., if these between-group differences within each freed path provides statistical evidence of improved model fit, assuming the previously tested full models suggest that there were differences across groups that needed to be explored). More specifically, because the omnibus test tells me that freeing constraints helps my model fit better, I freed my constrained model one at a time to see if I could isolate what specific paths are providing the better fit (i.e., which paths are significantly different across groups). My results from this entire process are described below.

First, I tested if my full model was better explained (i.e., had significantly better fit) by the effect of all of my predictors being equivalent across groups or varied across groups. The approach I used tested a fully unconstrained model first (i.e., the effect of all of my predictors being allowed to vary across the five groups), and then compared this to a fully constrained model (i.e., the effect of all of my predictors being set to be equal across the five groups). The fully unconstrained model allowed all estimates to vary

across groups (overall, this model demonstrated poor fit: $\chi^2(45) = 862.34$, $p < .001$; RMSEA = .17 (90% C.I.: .16–.18)). The fully constrained model constrained all estimates to be equal across groups (overall, this model also demonstrated poor fit: $\chi^2(85) = 907.70$, $p < .001$; RMSEA = .12 (90% C.I.: .11–.13)). The fully unconstrained model was then compared to the fully constrained model, and the chi-square difference test between these two models was significant (with the fully unconstrained model fitting better than the fully constrained model; $\Delta\chi^2(\Delta 40) = 58.51$, $p < .05$), signifying that one or more individual paths (predictors) in the model significantly differed by 8th grade music type. Results from the fully unconstrained model, by group, can be viewed here: band-only group (Table 19), chorus-only group (Table 20), guitar-only group (Table 21), orchestra-only group (Table 22), and multiple-music-type group (Table 23). The tables just described only flag significant moderators and predictors *after* individual path analyses were conducted (this process is described below).

Now, a series of slightly less (i.e., partially) constrained models (i.e., with only one path at a time free to vary across groups, with all other paths still constrained) were tested (using the same chi-square difference test technique) one-by-one for each path/predictor to be compared with the fully constrained model, allowing me to determine which of the predictors was moderated by 8th grade music type (and for which groups these predictors were significantly different). After every single path was independently tested to see if model fit improved when that variable was free to vary across groups, only three predictors had significant chi-square difference tests. These variables were *gender* ($\Delta\chi^2(\Delta 4) = 14.12$, $p < .01$), *gifted status* ($\Delta\chi^2(\Delta 4) = 18.66$, $p <$

.001), and standardized *math* scores ($\Delta\chi^2(\Delta 4) = 10.09$, $p < .05$). In other words, all other predictors acted the same across groups, but gender, gifted status, and math varied across groups. In terms of which groups differed on these significant paths, the following results emerged.

The effect of being male was different across groups. Being a male that enrolled exclusively in either band, chorus, or orchestra in 8th grade had *no effect* on persisting with any music into 9th grade (*p*'s > .05). Conversely, being a male that enrolled exclusively in guitar *or* enrolled in more than one music type in 8th grade had a *significant effect* on persisting with any music into 9th grade (*p*'s < .01 and .05, respectively). ORs show male students in exclusively 8th grade guitar had 77% greater odds of persisting into any music in 9th grade compared to female students in 8th grade guitar (see Table 21), and male students in more than one 8th grade music type have 143% greater odds of persisting into any music in 9th grade compared to female students in more than one 8th grade music type (see Table 23). The effect of being male on 9th grade any-music persistence was more important in guitar and being in multiple music types (both for positive associations), as compared to being in band, chorus, or orchestra.

The effect of being gifted was different across groups. Being a student that had ever been gifted that enrolled exclusively in either band, guitar, or orchestra in 8th grade had *no effect* on persisting with any music into 9th grade (*p*'s > .05). But students that were ever gifted that enrolled in exclusively chorus *or* enrolled in more than one music type in 8th grade had a *significant effect* on persisting with any music into 9th grade (*p*'s < .001 and .05, respectively). ORs show ever gifted students in exclusively 8th grade chorus

have 69% greater odds of persisting into any music in 9th grade compared to non-gifted students in 8th grade chorus (see Table 20), while ever gifted students in more than one music type have 82% *decreased* odds of persisting into any music in 9th grade compared to ever gifted students in more than one 8th grade music type (see Table 23). The effect of ever being gifted on 9th grade any-music persistence was more important for chorus and those in multiple music types (albeit each had an *opposite* relationship), as compared to being in band, guitar, or orchestra.

The effect of a 1-point increase in 8th grade math scores was different across groups. This means that a 1-point increase in math scores for students enrolled exclusively in chorus, guitar, orchestra, or those in more than one music type in 8th grade had *no effect* on persisting with any music into 9th grade (p's > .05). But a 1-point increase in math scores for students enrolled in exclusively band in 8th grade had a *significant effect* on persisting with any music into 9th grade ($p < .001$). ORs show a 1-point increase in math scores for students in 8th grade band have 24% greater odds of persisting into 9th grade any music (see Table 19). The effect of a 1-point increase in 8th grade math scores was more important in band (with a positive association), as compared to chorus, guitar, orchestra, and being in multiple music types.

These three moderators (that each represented a free path) can then be displayed with all of the other predictors (that are still constrained to be equal across groups). These results, from the entire multigroup analytic process, can been seen in Table 24. The constrained paths that were *significant* across all groups were only 8th grade GPA and 8th grade reading scores (and ELL status trended towards significance, but never surpassed

the $p < .05$ threshold). The effect of a 1-point increase in GPA was generalizable across 8th grade music types ($p < .001$), with ORs showing that all 8th grade music students have 25% greater odds of persisting with any music into 9th grade with every 1-point increase in GPA. The effect of a 1-point increase in reading scores was generalizable across 8th grade music types ($p < .05$), with ORs showing that all 8th grade music students have 10% greater odds of persisting with any music into 9th grade with every 1-point increase in reading scores. These academic achievement measures matter for any-music persistence into 9th grade regardless of exclusive 8th grade music type or being in more than one 8th grade music type.

DISCUSSION

This thesis aimed to a) provide empirical evidence of persistence rates in music electives from 8th to 9th grade, b) explore if known predictors of music enrollment also predict music persistence during this transition to high school, and c) understand how persistence rates and predictors may differ from one music type to another. Much research has highlighted the "who" and "what" of initial engagement with in-school music electives (Alegrado & Winsler, 2020; Kinney, 2008), but little research has extended this focus into students who continue to enroll in music over time. Music students' continued enrollment is a known concern of music educators (Williams, 2007, 2011), especially during the transition from middle to high school (Evans & McPherson, 2017; Symonds et al., 2017). Using a large longitudinal dataset to put numbers, and a "face," to the persistence problem has been sorely needed.

Any Music

In my large, low-income, predominately Hispanic sample (n = 3,393), only about 1 in 4 students (24.5%) that were enrolled in any music in 8th grade persisted with any music into 9th grade. This persistence rate is difficult to contextualize because true persistence of (the same) students from one year to the next, longitudinally, has not been systematically examined in previous research. Addressing this gap in the literature is one of the major contributions of this study. The current study explored true persistence

within students in order to understand how those who continue to enroll in music may be different from those that do not—and in turn, if the same demographic and achievement variables that predict initial music enrollment (i.e., selection) also predict continued music enrollment (i.e., persistence). This approach requires controlling for if students were in music *the year before* to accurately measure who is, and who is not, persisting.

Prior longitudinal, cross-sectional, and survey-based research has only talked about persistence in terms of overall enrollment in music electives from grade to grade (and usually as an ancillary finding compared to the main focus of the study, e.g., selection). For example, Alegrado and Winsler (2020), in prior longitudinal work looking at selection into middle school music in the current dataset, reported that there were approximately half (55.1%) the number of students enrolled in any 8th grade music as there previously were in any 7th grade music. But if new, first-time 8th grade music students were excluded from this 8th grade total (because they just joined music, and would not be a "persister"), the lack of students actually *continuing* (i.e., persisting) with music from 7th to 8th grade would be even more jarring. To be clear, though, it is important to note that the above study (like most) was not actually interested in studying *persistence*, so reporting the numbers in this way is in no way inaccurate or misleading. This approach still provides insight into the "dropout problem" from a program-level perspective by showing that overall any-music enrollment declines from grade to grade even after new, "late joining" music students are factored into the total. But to get at the heart of the dropout problem, a deliberate focus needs to directed towards the students that *were* enrolled in music the year prior, but *now* choose to no longer continue with

music. *These* students (i.e., the "quitters"), and their persisting counterparts, should receive the undivided attention of music education stakeholders interested in actually rectifying the dropout problem.

The current study has displayed that—during the transition from 8th to 9th grade—students that persist in any music look somewhat different from those that do not. Students that persist are more academically competent in 8th grade than those that do not, and, interestingly, are also *more* likely to have a disability than students that do not persist. Being a former ELL also appears to slightly favor persistence, but this trend never reached statistically significance in the any-music persistence aggregate.

The most robust predictor—prior academic achievement (i.e., better 8th grade GPA and reading and math scores)—is directly in line with previous findings in the selection literature (Elpus & Abril, 2011, 2019), meaning that, *again*, music and high academic achievement are closely intertwined (but now specifically within the realm of persistence). Hetland and Winner (2001), and more recently Holochwost et al. (2017), have hypothesized that the relationship between music and academic achievement is likely complex, involves multiple cognitive mediators, and is *bidirectional*—partially fueled by selection effects, and partially fueled by music electives strengthening habits of mind, or strategies, that generalize to the classroom setting (Hogan & Winner, 2019). Framing this in terms of *opportunity costs*, it is plausible that high-performing students in school are just more easily able to continue to take music without it impacting other aspects of the school/social life (possibly *because of* skills bolstered in music, and/or possibly *because of* skills that student already possessed before music). Conversely, low

academically performing students may be pressured *out* of music by parents or administrators, and in some cases be forced into remedial courses (*regardless* of if any general strategies that may have helped the student in school were actually learned through music). This association is in *dire* need of rejuvenated research, not so it can reemerge as an advocacy talking point, but so that the potentially *unique* skills that music—not other academic subjects—fosters within schools can be better understood (Hetland & Winner, 2001).

Also, finding that students with disabilities are more likely to be persisters—after controlling for all other potential predictors of persistence including performance in school—is a very surprising finding. In the selection literature, the *opposite* finding is true (most notably in band and guitar)—albeit very few studies have actually explored this association (see Alegrado & Winsler, 2020). While music electives may not do a very good job at initially attracting and adapting to students with disabilities, it appears that once students with disabilities are enrolled, they feel welcomed and empowered within the music classroom. This finding is also promising news for students with disabilities, given their particular challenges adapting during the transition from middle to high school (Letrello & Miles, 2003).

Importantly, though, it is probably most encouraging that *so few* (i.e., only 4 out of 10) demographic and prior achievement predictors actually predicted persistence. In the selection literature, the differences between music-takers and non-music-takers is vast (Elpus & Abril, 2019; Kinney, 2019). Alegrado and Winsler (2020) found that *at least* 7 of their 10 demographic and achievement predictors significantly predicted selection

(when looking at any-music *in the current dataset*), showing that students who initially selected into music in middle school were less likely to be disabled or in poverty, had stronger school readiness skills 7 years earlier, and were already doing better in school before they enrolled in their first music elective in middle school. This showcases the huge disparities—on completely non-musical metrics—between students that do and do not seek initial engagement in school music electives. The current study still finds significant differences between any music persisters and non-persisters, but these differences are *not* because of ethnicity, gender, poverty status, gifted-and-talented status, or prior retention in school. These metrics are often immense barriers that bar students from ever getting to experience music in school, but once these students are "in the door," these metrics no longer seem to define what students are most like to continue their musical experience. Even though there are still major systematic disparities between what students select into music, the fact that these same populations of students *are not* also being systematically pushed out of music disproportionately, once in, is reassuring.

One interpretation of the meager number of significant predictors of persistence is that the further along students get within music, the less and less these non-musical characteristics matter in determining subsequent enrollment. Instead, a latent "enjoyment of music" or "satisfaction with the music teacher/program" or "level of musical proficiency" is likely what is accounting for who does and does not continue in music. This, of course, is a *good thing*, as a student's enjoyment or excellence in music *should* reliably predict persistence. This is in stark contrast between the inequalities observed in initial music participation, where *nothing* about a student's enjoyment or excellence in

music is needed to reliably predict—with concerning accuracy—if that student will enroll in music or not. Even though disadvantaged groups do not appear to be getting pushed out of persisting in music at higher rates compared to other students, *all students* are leaving *all types* of music program during this transition at disturbing rates. These findings will be discussed further in the implications section.

Within Music Types

In addition to exploring potential predictors of persistence for any-music taking from 8th to 9th grade, predictors were also explored within each music type (band, chorus, guitar, orchestra). These separate analyses are not meant to equate and draw direct comparisons across music types, but instead to inform specific music educators (i.e., band directors, chorus teachers, guitar instructors, and orchestra conductors) what predictors of persistence predict persistence in that specific music type. More direct comparisons between music types will be discussed later with respect to a multigroup model that was run for any-music persistence (which also explored the effect of being in more than one music type on 8th grade).

In band, only 20.4% of students that were enrolled in 8th grade band continued band in 9th grade. Three predictors significantly predicted persistence within band: gender, 8th grade GPA, and 8th grade math scores (reading also trended towards significance). Male students were more likely to persist than female students, which is in-line with previous research that shows major gender differences in band engagement (Alegrado & Winsler, 2020). Much of this disparity is akin to stereotypes regrading band enrollment generally (Kinney, 2010), but especially within the different musical

instrument types that male and female students are socialized into (Wrape et al., 2016). Higher academic performance for band persisters is not surprising given grades have been one of the most consistent predictors of self-selecting into band (Elpus & Abril, 2019). Many theorized mechanisms for this association have been proposed, but one the most common highlights the broad "thinking dispositions" that band provides to its students (Hogan & Winner, 2019). It is notable that economic and ethnic differences do *not* emerge within band persistence, as many researchers have thought that band's high financial costs (e.g., for instrument rentals, etc.) are one of the main reasons for band's disproportionately white and affluent population historically (Kinney, 2010).

In chorus, 21.8% of students who were enrolled in 8th grade chorus persist into 9th grade chorus. Three predictors significantly predicted chorus persistence: poverty status, gifted status, and standardized math scores (being female also trended towards significance). Students *not* receiving free or reduced priced lunch were *more* likely to persist than their more economically disadvantaged peers. This finding goes against conventional wisdom in the field that has claimed that chorus is the most financially equitable music type because of its lack of extraneous costs (e.g., compared to band; Kinney, 2010). Instead, especially in this low-SES sample, this finding—coupled with the gifted finding—may suggest that more socioeconomically and academically advantaged students may see choir as a good (and possibly "less rigorous") elective to take that may not take away time for other classes/clubs, while still fulfilling a musical desire (Elpus & Abril, 2019). Additionally, math scores being a predictor is somewhat

surprising given the mixed findings between chorus and academic performance (Elpus, 2013), and the ambiguous connection between vocal performance and mathematics.

In guitar, only a mere 12.3% of 8th grade guitar students persisted into 9th grade guitar. The only significant predictor of guitar persistence was being a male, with male students being more than twice as likely to persist than female students. Gender differences are known in guitar (Alegrado & Winsler, 2020), but they are not usually this pronounced. Also, the low rate of persistence in guitar students is not unexpected given its small ensemble setting. Larger ensemble music types (e.g., band, chorus, orchestra) are known to have more social cohesion, which in-turn usually spurs higher return rates (Dagaz, 2012).

In orchestra, only 20.4% of students persisted. The only significant predictor of persistence was being a former ELL. Prior research has shown a connection between bilingualism and instrumental music engagement (Bialystok & DePape, 2009), so this relationship is somewhat expected. Also, while only trending significant, orchestra displayed the only sign of ethnic disparities with respect to persistence. White and Asian students were more likely to be persisters that Hispanic students. This disparity is prevalent not only within high school orchestra electives, but also within professional orchestras (DeLorenzo, 2012).

Multigroup analyses were then run to see how select predictors varied across music types. This analysis was now no longer only looking at persistence *within* each specific music type, but instead used 8th grade music type as a grouping variable and examined how the music type a student was in impacted a) *any*-music persistence in 9th

grade and b) how certain predictors directly varied *across* music types (including a fifth, separate, group for if students were in more than one music type in 8th grade). The multigroup analysis confirmed that one or more of the predictors of 9th grade any-music persistence *did* significantly vary by 8th grade music type, warranting further, path-by-path exploration.

The multigroup analysis confirmed that prior academic achievement metrics (i.e., 8th grade GPA and 8th grade reading scores) are, again, robust predictors of any-music persistence into 9th grade, irrespective of the music type the student was involved in during 8th grade. This means these specific findings are generalizable across every music type, as well as taking more than one music type. It is not particularly surprising that prior academic achievement—one of the surest indicators of ever enrolling in a music elective—is, therefore, *also* a significant predictor of continued enrollment in music.

The multigroup analysis also uncovered that gender, gifted status, and math scores related to any-music persistence, but only for certain music types in 8th grade (revealing "for whom" certain predictors predict any-music persistence). For gender, being male in guitar and multiple music types (positively) predicted any-music persistence, but being male in the other music types did not. For gifted status, being gifted in chorus and for multiple music types (positively and negatively, respectively) predicted any-music persistence, but being gifted in the other music types was unrelated to persistence. And for math, scoring better on the standardized math assessment while in band (positively) predicted persistence, but scoring better on math in the other music types did not. These moderations observed on these three predictors tell me some of the

most direct differences existing between different music types. While understanding between-group differences amongst individual music types is important, these findings also underscore the importance of looking at students that were in *more than one* music type. Encouraging students to take more than one music type in middle school may be one of the most straightforward ways to boost persistence rates in later grades. With the larger sample size for multiple music takers in 8th grade, the student is more likely to find something they enjoy in music, giving them a reason to continue. This approach, of course, cannot be the only solution, and also will not succeed if the student experience in the music class is poor (regardless of if they are in more than one). Nevertheless, this is still an important avenue for future research.

Limitations

Although the current study has its strengths (e.g., a large and ethnically diverse longitudinal sample, a rigorous operationalization of persistence, school administrative data rather than self-report), there are limitations that should be discussed. The first important limitation is that the *quality* of the music education (both generally, but also in each specific music type, classroom, etc.) is unknown. Poor quality *alone* can explain why extremely low persistence rates were observed in this sample (Johnson, 2004). More qualitative research would be of immense value to the persistence literature, because it can uncover exactly *why* these students are choosing to continue, or cease, musical involvement. Another important limitation is that I have no additional information on music exposure *outside* (i.e., at home, outside of school, etc.) of the elective courses the students took. Detailed longitudinal studies that have access to if students partook in

these alternative musical experiences, and can thus control for them, are certainly welcomed.

Implications

One important implication of this study is that demographic and achievement characteristics appear to say *less* about prolonged musical engagement than they say about initial musical engagement. This should, in turn, say *more* about how to contrast what best practices are for *recruiting students*, compared to what best practices are for *keeping students*. Recruitment events and entry-level ensembles should be crafted in ways that promote inclusivity, dismantle barriers for entry, and intentionally target welcoming the students that numerous researchers have shown are least likely to *ever* step a foot into a music classroom. The best opportunity for these targeted outreaches is when in-school music electives first begin being offered. But *keeping* students that have already chosen to enroll in music requires a different approach (and is in need of research showing what works best). Most notably, the experience within each music classroom should first and foremost be catered towards fostering a love and appreciation for music, not just, for example, proficiency of one's major and minor scales.

Also, finding more ways to get these adolescents actively involved in the learning and teaching experience towards their peers is likely to bolster more deep connections to the music program and the individuals in it (Dagaz, 2012). The social aspects of these large ensemble music classes are known strengths in keeping students "in the door" (Campbell et al., 2007), but finding more ways to make this aspect a core part of the overall experience (instead of what happens *after* rehearsal) should be explored. The

more musical classrooms in middle and high schools can be catered toward the actual needs of the adolescent (i.e., autonomy, identity, and intimacy), the more these classrooms will become contexts for development that most—instead of a select few—students *will not want* to leave.

Additionally, finding that students with disabilities are thriving and wanting to continually pursue music is very instructive and should motivate researchers, and educators, to better understand the mechanisms driving this effect. This population of students should be explored more and, importantly, can serve as a *model* for how to effectively turn a typically disadvantaged population (especially during the transition from middle to high school; Letrello & Miles, 2003) into an *asset* for the longevity of the program (i.e., through prioritizing persistence).

Furthermore, persistence research presents a unique opportunity to combine the access and selection literatures, with the outcomes literature. For example, knowing that more academically competent students attend a school involving music (access), seek out music (selection), now *persist* in music (persistence), and after controlling for selection effects, still appear to have increased academic performance (outcomes) in a wide variety of music electives... what does this tell the field? Is music really the underlying mechanism amidst all of these findings? If so, what aspect of music is driving these effects? If music really improves academic performance, and academic performance predicts persistence, why are persistence rates so low? Are there other explanations that can explain these trends outside of music? Persistence research allows for questions like

these to be viewed in a whole new light, and—hopefully—be an important piece of driving the music education literature, as a whole, forward.

Finally, it should be noted that while studying "persistence" in this way (in a *domain-specific* sense) is important (i.e., continued involvement in a *music elective* from one year to the next), the true psychological mechanisms underpinning whatever embodies "persistence" (in a *domain-general* sense) is vast and multivariate (i.e., the qualities that bolster continued involvement in *any* domain/activity/task). General persistence (or *perseverance*)—psychologically—likely involves (but is not limited to) aspects of intrinsic and extrinsic motivation, self-esteem, identity, skill mastery, work ethic, social support, and temperamental and personality characteristics (e.g., conscientiousness). Moreover, these separate conceptions of persistence are also presumably *not* mutually exclusive, and, if anything, are likely very much intertwined. Disentangling how (specific) persistence in music also relates to (general) persistence in other areas—inside and outside of school—would also be a fertile area of future research.

Future Directions

Future research should continue to explore persistence within music in this new and informative way, but over a larger time scale. It is likely that persistence in music is a problem across most (if not all) grade transitions, but how these challenges differ at each step (and relate to psychological persistence more generally) is unclear. Regardless, without evidence these questions are impossible to know. Further exploring single grade transitions may be informative, but large-scale efforts to understand how persistence in music looks across both middle and high school, *in their entirety*, would be extremely

informative to the field. As always, more qualitative research that can add to the emerging quantitative data being added to the music persistence literature is vital. Understanding large-scale patterns and predictors is extremely important, but if strictly quantitative work is also trying to answer the underlying "why," the field's understanding of this phenomenon will continue to be incomplete. As mentioned previously, there are major opportunities moving forward to further integrate findings across the fields of access, selection, outcomes, and persistence to gain a more holistic understanding of the current state of music education today—these efforts are still greatly needed.

Persistence research within music education has been ignored for far too long. This thesis hopes to lay a promising foundation for future work investigating persistence. As the saying goes, it is time to face the music.

TABLES

Table 1. Missing Data on All Predictors (Total *N* = 3,393)

Variable	*n*	*%*
Gender	3,382	0.3%
Ethnicity	3,379	0.4%
ELL Status in K	3,393	0.0%
Disability Status in G8	3,393	0.0%
Poverty Status in G8	3,389	0.1%
Social Skills in Pre-K	2,874	15.3%
Behavioral Concerns in Pre-K	2,874	15.3%
Gross Motor Skills in Pre-K	1,836	45.9%
Fine Motor Skills in Pre-K	2,093	38.3%
Cognitive Skills in Pre-K	2,083	38.6%
Language Skills in Pre-K	2,092	38.3%
Gifted Status Ever	3,393	0.0%
Retention Status Ever	3,393	0.0%
GPA in G8	3,393	0.0%
FCAT Reading in G8	2,582	23.9%
FCAT Math in G8	1,578	53.5%

Table 2. Music Persistence Rates From 8th to 9th Grade By Music Type

Music Type	*Enrolled in 8th Grade*	*Persisted to 9th Grade*
	n	*n (%)*
Any Music	3,202	784 (**24.5%**)
Band	1,923	392 (**20.4%**)
Chorus	593	129 (**21.8%**)
Guitar	341	42 (**12.3%**)
Orchestra	486	99 (**20.4%**)
Multiple (2+)	81	*1 Type:* 25 (**30.9%**) *2 Types:* 6 (**7.4%**)

Note. The "Band" line, for example, shows how many students in band in 8th grade were also in band in 9th grade (regardless of other potential music types that student was also enrolled in). These persistence rates are not meant be for students *only* in each music type, because that would not fully show what true persistence looks like for each music type. This also means that students in the "Multiple" category are *also* counted in the music type totals. The category totals above are *not* supposed to add up to the "Any Music" total.

Table 3. Group Differences in **Any-Music** Persistence from 8th to 9th Grade

Variable	Persisters	
	n	%
Total (*n* = 3,202)	784	24.5%
Gender		
Female (*n* = 1,541)	369	23.9%
Male (*n* = 1,651)	410	24.8%
Ethnicity**		
White/Other (*n* = 244)	70	28.7%
Hispanic (*n* = 1,992)	515	25.9%
Black (*n* = 914)	185	20.2%
Asian/Pacific Islander (*n* = 40)	8	20.0%
English Language Learner**		
Not former ELL (*n* = 1,311)	285	21.7%
Former ELL (*n* = 1,891)	499	26.4%
Disability Status		
Non-disabled (*n* = 2,897)	698	24.1%
Disabled (*n* = 305)	86	28.2%
Poverty Status		
No free/reduced lunch (*n* = 724)	195	26.9%
Free/reduced lunch (*n* = 2,474)	587	23.7%
Ever Gifted		
Never gifted (*n* = 2,476)	588	23.7%
Gifted (*n* = 726)	196	27.0%
Ever Retained		
Never retained (*n* = 2,881)	708	24.6%
Retained (*n* = 321)	76	23.7%

Note. Chi-square analyses. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Table 4. Mean Differences in **Any-Music** Persistence from 8th to 9th Grade

Variable	Persisters (n = 784)			Non-Persisters (n = 2,418)		
	n	*M*	*SD*	*n*	*M*	*SD*
School Readiness at Age 4						
Social skills	652	61.15	(27.83)	2,062	60.84	(27.50)
Behavioral concerns	652	43.67	(28.34)	2,062	43.90	(28.83)
Gross motor skills	420	65.43	(30.63)	1,333	68.05	(28.36)
Fine motor skills	473	61.77	(27.35)	1,521	59.92	(28.26)
Cognitive skills	463	58.32	(29.06)	1,519	57.39	(30.20)
Language skills	466	48.80	(30.29)	1,527	48.26	(31.64)
8th Grade Academic Performance						
GPA***	784	4.05	(0.60)	2,418	3.94	(0.64)
FCAT reading***	591	3.39	(1.04)	1,842	3.14	(1.19)
FCAT math***	343	2.92	(1.13)	1,130	2.55	(1.14)

Note. GPA = grade point average; FCAT = Florida Comprehensive Assessment Test. Equal variances not assumed for GPA, FCAT reading, or FCAT math.
t-test analyses. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Table 5. Logistic Regression Predicting **Any-Music** Persistence from 8th to 9th Grade

	Step 1		Step 2	
	Odds Ratio	*SE(B)*	Odds Ratio	*SE(B)*
Demographics				
Ethnicity-Race				
Hispanic/White	.815	.163	.851	.166
Black/White	**.693***	.173	.805	.178
Asian/White	.591	.418	.568	.420
Black/Hispanic	.850	.122	.946	.125
Male	1.011	.084	1.064	.086
Former English Language Learner	1.228†	.108	1.213†	.109
Special Education	1.223	.135	**1.363***	.145
Received Free/Reduced Lunch	.864	.102	.955	.107
Academic Achievement				
Ever Gifted			.969	.115
Ever Retained			1.126	.154
GPA in 8th Grade			**1.186***	.086
Standardized Reading in 8th Grade			**1.150****	.053
Standardized Math in 8th Grade			**1.279*****	.066

Note. †$p < .10$, *$p < .05$, **$p < .01$, ***$p < .001$. To analyze the fourth ethnicity contrast (Black/Hispanic) I ran another regression model flipping the reference group from White to Hispanic students. All models run with standardized reading, but a separate model run to analyze math.

Table 6. Predictors of Music Persistence from G8 to G9 Within Each Music Type (Separate Models)

	Any Music	Band	Chorus	Guitar	Orchestra
Demographics					
Ethnicity-Race					H<W
Male		+	–	+	
Former English Language Learner	+				+
Special Education	+				
Received Free/Reduced Lunch			–		
Academic Achievement					
Ever Gifted			+		
Ever Retained					
GPA in G8	+	+			
Standardized Reading in G8	+	+			
Standardized Math in G8	+	+	+		

Note. $p < .10$, $p < .05$. + for odds ratio greater than 1; – for odds ratio less than 1. H for Hispanic; W for White. Column names correspond with separate dependent variables for persistence (each run as a separate model).

Table 7. Group Differences in **Band** Persistence from 8th to 9th Grade

Variable	Persisters	
	n	%
Total (*n* = 1,923)	392	20.4%
Gender*		
Female (*n* = 750)	134	17.9%
Male (*n* = 1,166)	256	22.0%
Ethnicity*		
White/Asian/Other (*n* = 131)	33	25.2%
Hispanic (*n* = 1,186)	256	21.6%
Black (*n* = 597)	100	16.8%
English Language Learner		
Not former ELL (*n* = 805)	148	18.4%
Former ELL (*n* = 1,118)	244	21.8%
Disability Status		
Non-disabled (*n* = 1,722)	345	20.0%
Disabled (*n* = 201)	47	23.4%
Poverty Status		
No free/reduced lunch (*n* = 356)	77	21.6%
Free/reduced lunch (*n* = 1,566)	315	20.1%
Ever Gifted		
Never gifted (*n* = 1,532)	309	20.2%
Gifted (*n* = 391)	83	21.2%
Ever Retained		
Never retained (*n* = 1,694)	345	20.4%
Retained (*n* = 229)	47	20.5%

Note. Chi-square analyses. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Table 8. Mean Differences in **Band** Persistence from 8th to 9th Grade

Variable	Persisters (n = 392)			Non-Persisters (n = 1,531)		
	n	*M*	*SD*	*n*	*M*	*SD*
School Readiness at Age 4						
Social skills	321	59.33	(29.02)	1,296	59.01	(27.74)
Behavioral concerns	321	45.14	(28.97)	1,296	45.73	(28.80)
Gross motor skills	210	66.90	(29.74)	825	68.40	(28.72)
Fine motor skills	235	58.60	(28.23)	936	57.71	(28.54)
Cognitive skills	233	57.57	(28.52)	937	54.61	(30.55)
Language skills	233	47.99	(28.95)	938	45.27	(31.29)
8th Grade Academic Performance						
GPA***	392	4.01	(0.61)	1,531	3.84	(0.67)
FCAT reading***	304	3.32	(1.05)	1,159	3.02	(1.21)
FCAT math***	170	2.92	(1.14)	726	2.42	(1.10)

Note. GPA = grade point average; FCAT = Florida Comprehensive Assessment Test. Equal variances not assumed for GPA or FCAT reading.
t-test analyses. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Table 9. Logistic Regression Predicting **Band** Persistence from 8th to 9th Grade

	Step 1		Step 2	
	Odds Ratio	*SE(B)*	Odds Ratio	*SE(B)*
Demographics				
Ethnicity-Race				
Hispanic/White	.773	.229	.815	.235
Black/White	.626†	.241	.760	.251
Black/Hispanic	.808	.166	.933	.172
Male	1.239†	.122	**1.385****	.125
Former English Language Learner	1.122	.149	1.068	.151
Special Education	1.166	.178	1.242	.196
Received Free/Reduced Lunch	1.003	.150	1.163	.158
Academic Achievement				
Ever Gifted			.795	.168
Ever Retained			1.282	.199
GPA in 8th Grade			**1.505*****	.116
Standardized Reading in 8th Grade			1.133†	.072
Standardized Math in 8th Grade			**1.411*****	.090

Note. †$p < .10$, *$p < .05$, **$p < .01$, ***$p < .001$. To analyze the third ethnicity contrast (Black/Hispanic) I ran another regression model flipping the reference group from White to Hispanic students. All models run with standardized reading, but a separate model run to analyze math.

Table 10. Group Differences in **Chorus** Persistence from 8th to 9th Grade

Variable	Persisters	
	n	%
Total (*n* = 593)	129	21.8%
Gender*		
Female (*n* = 489)	115	23.5%
Male (*n* = 103)	14	13.6%
Ethnicity**		
White/Asian/Other (*n* = 57)	12	21.1%
Hispanic (*n* = 324)	86	26.5%
Black (*n* = 211)	31	14.7%
English Language Learner**		
Not former ELL (*n* = 294)	50	17.0%
Former ELL (*n* = 299)	79	26.4%
Disability Status		
Non-disabled (*n* = 533)	119	22.3%
Disabled (*n* = 60)	10	16.7%
Poverty Status**		
No free/reduced lunch (*n* = 151)	46	30.5%
Free/reduced lunch (*n* = 441)	82	18.6%
Ever Gifted***		
Never gifted (*n* = 471)	88	18.7%
Gifted (*n* = 122)	41	33.6%
Ever Retained		
Never retained (*n* = 538)	119	22.1%
Retained (*n* = 55)	10	18.2%

Note. Chi-square analyses. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Table 11. Mean Differences in **Chorus** Persistence from 8th to 9th Grade

Variable	Persisters (n = 129)			Non-Persisters (n = 464)		
	n	*M*	*SD*	*n*	*M*	*SD*
School Readiness at Age 4						
Social skills	112	66.71	(25.11)	397	64.65	(26.83)
Behavioral concerns	112	42.54	(26.90)	397	42.25	(28.11)
Gross motor skills	68	65.72	(29.81)	246	70.14	(26.34)
Fine motor skills	79	65.28	(27.30)	282	65.72	(28.14)
Cognitive skills	75	58.01	(29.83)	286	58.64	(29.38)
Language skills	77	52.94	(30.86)	288	53.05	(33.06)
8th Grade Academic Performance						
GPA*	129	4.12	(0.53)	464	3.99	(0.59)
FCAT reading*	102	3.36	(1.01)	366	3.08	(1.17)
FCAT math**	67	2.91	(1.04)	240	2.43	(1.07)

Note. GPA = grade point average; FCAT = Florida Comprehensive Assessment Test.
t-test analyses. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Table 12. Logistic Regression Predicting **Chorus** Persistence from 8th to 9th Grade

	Step 1		Step 2	
	Odds Ratio	*SE(B)*	Odds Ratio	*SE(B)*
Demographics				
Ethnicity-Race				
Hispanic/White	1.498	.405	1.616	.425
Black/White	.939	.432	1.047	.454
Black/Hispanic	.627	.292	.648	.290
Male	.566†	.322	.522†	.332
Former English Language Learner	1.385	.264	1.432	.259
Special Education	.754	.361	.961	.404
Received Free/Reduced Lunch	**.479****	.243	**.493****	.252
Academic Achievement				
Ever Gifted			**2.204****	.258
Ever Retained			1.165	.420
GPA in 8th Grade			1.013	.216
Standardized Reading in 8th Grade			1.076	.122
Standardized Math in 8th Grade			**1.332***	.146

Note. †$p < .10$, *$p < .05$, **$p < .01$, ***$p < .001$. To analyze the third ethnicity contrast (Black/Hispanic) I ran another regression model flipping the reference group from White to Hispanic students. All models run with standardized reading, but a separate model run to analyze math.

Table 13. Group Differences in **Guitar** Persistence from 8th to 9th Grade

Variable	Persisters	
	n	%
Total (*n* = 341)	42	12.3%
Gender*		
Female (*n* = 116)	7	6.0%
Male (*n* = 225)	35	15.6%
Ethnicity		
White/Asian/Other (*n* = 32)	4	12.5%
Hispanic (*n* = 232)	31	13.4%
Black (*n* = 77)	7	9.1%
English Language Learner		
Not former ELL (*n* = 104)	10	9.6%
Former ELL (*n* = 237)	32	13.5%
Disability Status		
Non-disabled (*n* = 311)	40	12.9%
Disabled (*n* = 30)	2	6.7%
Poverty Status		
No free/reduced lunch (*n* = 73)	7	9.6%
Free/reduced lunch (*n* = 268)	35	13.1%
Ever Gifted		
Never gifted (*n* = 260)	34	13.1%
Gifted (*n* = 81)	8	9.9%
Ever Retained		
Never retained (*n* = 305)	38	12.5%
Retained (*n* = 36)	4	11.1%

Note. Chi-square analyses. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Table 14. Mean Differences in **Guitar** Persistence from 8th to 9th Grade

Variable	Persisters (n = 42)			Non-Persisters (n = 299)		
	n	*M*	*SD*	*n*	*M*	*SD*
School Readiness at Age 4						
Social skills	39	53.85	(25.60)	252	58.80	(28.07)
Behavioral concerns	39	42.41	(29.02)	252	46.74	(29.64)
Gross motor skills	27	63.00	(31.49)	185	69.03	(28.32)
Fine motor skills	31	64.81	(27.43)	211	60.66	(26.96)
Cognitive skills	32	67.88	(24.33)	207	61.38	(28.93)
Language skills	31	42.58	(28.67)	213	51.62	(31.08)
8th Grade Academic Performance						
GPA	42	4.01	(0.62)	299	3.97	(0.66)
FCAT reading	30	3.40	(1.00)	211	3.26	(1.10)
FCAT math	20	3.05	(1.05)	129	2.97	(1.16)

Note. GPA = grade point average; FCAT = Florida Comprehensive Assessment Test.
t-test analyses. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Table 15. Logistic Regression Predicting **Guitar** Persistence from 8th to 9th Grade

	Step 1		Step 2	
	Odds Ratio	*SE(B)*	Odds Ratio	*SE(B)*
Demographics				
Ethnicity-Race				
Hispanic/White	.801	.607	.697	.641
Black/White	.619	.673	.599	.728
Black/Hispanic	.773	.520	.860	.542
Male	**3.014***	.443	**3.222***	.457
Former English Language Learner	1.383	.461	1.550	.469
Special Education	.424	.760	.437	.854
Received Free/Reduced Lunch	1.563	.469	1.684	.491
Academic Achievement				
Ever Gifted			.433	.523
Ever Retained			1.060	.658
GPA in 8th Grade			.954	.337
Standardized Reading in 8th Grade			1.410	.261
Standardized Math in 8th Grade			.784	.244

Note. $^{\dagger}p < .10$, $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$. To analyze the third ethnicity contrast (Black/Hispanic) I ran another regression model flipping the reference group from White to Hispanic students. All models run with standardized reading, but a separate model run to analyze math.

Table 16. Group Differences in **Orchestra** Persistence from 8th to 9th Grade

Variable	Persisters	
	n	%
Total (*n* = 486)	99	20.4%
Gender		
Female (*n* = 252)	54	21.4%
Male (*n* = 230)	43	18.7%
Ethnicity		
White/Asian/Other (*n* = 73)	19	26.0%
Hispanic (*n* = 333)	65	19.5%
Black (*n* = 76)	13	17.1%
English Language Learner*		
Not former ELL (*n* = 180)	28	15.6%
Former ELL (*n* = 306)	71	23.2%
Disability Status		
Non-disabled (*n* = 449)	90	20.0%
Disabled (*n* = 37)	9	24.3%
Poverty Status		
No free/reduced lunch (*n* = 180)	42	23.3%
Free/reduced lunch (*n* = 304)	56	18.4%
Ever Gifted		
Never gifted (*n* = 321)	68	21.2%
Gifted (*n* = 165)	31	18.8%
Ever Retained		
Never retained (*n* = 460)	94	20.4%
Retained (*n* = 26)	5	19.2%

Note. Chi-square analyses. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Table 17. Mean Differences in **Orchestra** Persistence from 8th to 9th Grade

Variable	Persisters (n = 99)			Non-Persisters (n = 387)		
	n	*M*	*SD*	*n*	*M*	*SD*
School Readiness at Age 4						
Social skills	81	65.49	(24.67)	332	63.76	(27.20)
Behavioral concerns	81	35.41	(26.02)	332	39.30	(28.83)
Gross motor skills	52	66.37	(32.06)	219	61.53	(31.05)
Fine motor skills	58	67.12	(21.56)	251	62.22	(26.71)
Cognitive skills	55	60.87	(31.21)	245	62.42	(29.76)
Language skills	55	50.93	(33.39)	248	52.08	(30.36)
8th Grade Academic Performance						
GPA	99	4.28	(0.46)	387	4.22	(0.53)
FCAT reading	67	3.67	(1.01)	297	3.66	(1.09)
FCAT math	39	3.05	(1.15)	156	3.06	(1.20)

Note. GPA = grade point average; FCAT = Florida Comprehensive Assessment Test.
t-test analyses. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Table 18. Logistic Regression Predicting **Orchestra** Persistence from 8th to 9th Grade

	Step 1		Step 2	
	Odds Ratio	*SE(B)*	Odds Ratio	*SE(B)*
Demographics				
Ethnicity-Race				
Hispanic/White	.533†	.341	.513†	.344
Black/White	.817	.415	.798	.423
Black/Hispanic	1.540	.396	1.555	.402
Male	.768	.238	.779	.242
Former English Language Learner	**2.354****	.323	**2.373****	.329
Special Education	1.340	.413	1.383	.430
Received Free/Reduced Lunch	.686	.249	.700	.254
Academic Achievement				
Ever Gifted			.705	.281
Ever Retained			.794	.551
GPA in 8th Grade			1.285	.279
Standardized Reading in 8th Grade			1.035	.171
Standardized Math in 8th Grade			1.134	.214

Note. †$p < .10$, *$p < .05$, **$p < .01$, ***$p < .001$. To analyze the third ethnicity contrast (Black/Hispanic) I ran another regression model flipping the reference group from White to Hispanic students. All models run with standardized reading, but a separate model run to analyze math.

Table 19. **Band-Only Group** (*n* = 1,890) from Multigroup Unconstrained Model

	Odds Ratio	*SE(B)*
Demographics		
Ethnicity-Race		
Hispanic/White	.883	.135
Black/White	.804	.143
Black/Hispanic	.912	.094
Male	1.090	.069
Former English Language Learner	1.018	.086
Special Education	1.160	.110
Received Free/Reduced Lunch	1.115	.091
Academic Achievement		
Ever Gifted	.976	.083
Ever Retained	1.088	.111
GPA in 8th Grade	**1.250**	.058
Standardized Reading in 8th Grade	**1.096**	.043
Standardized Math in 8th Grade	**1.236**	.054

Note. Odds ratios and standard errors are from the unconstrained multigroup model (where each predictor was free to vary across the five music groups). Individual path analyses were run to test which individual predictors, when only that path was free to vary across groups, were responsible for improved fit when compared to a nested model where each path was constrained across groups. Underlined predictors show that the path analysis confirmed that this predictor significantly differed across groups ($p < .05$). **Bolded** predictors signified that this predictor significantly predicts any-music persistence ($p < .05$). Odds ratios from the individual path analyses for predictors that are **both bolded and underlined** are discussed in more detail in the text. The above table just shows rough differences within this group, with further-tested significant predictors flagged through the bolded and underlining methods discussed above (overall results across all five groups of the multigroup analysis are summarized in Table 24).

Table 20. **Chorus-Only Group** (*n* = 575) from Multigroup Unconstrained Model

	Odds Ratio	*SE(B)*
Demographics		
Ethnicity-Race		
Hispanic/White	1.499	.237
Black/White	1.089	.225
Black/Hispanic	.728	.175
Male	.937	.164
Former English Language Learner	1.109	.163
Special Education	1.005	.236
Received Free/Reduced Lunch	.706	.138
Academic Achievement		
Ever Gifted	**1.685**	.143
Ever Retained	1.101	.231
GPA in 8th Grade	**1.063**	.111
Standardized Reading in 8th Grade	**1.089**	.077
Standardized Math in 8th Grade	1.174	.094

Note. Odds ratios and standard errors are from the unconstrained multigroup model (where each predictor was free to vary across the five music groups). Individual path analyses were run to test which individual predictors, when only that path was free to vary across groups, were responsible for improved fit when compared to a nested model where each path was constrained across groups. Underlined predictors show that the path analysis confirmed that this predictor significantly differed across groups ($p < .05$). **Bolded** predictors signified that this predictor significantly predicts any-music persistence ($p < .05$). Odds ratios from the individual path analyses for predictors that are **both bolded and underlined** discussed in more detail in the text. The above table just shows rough differences within this group, with further-tested significant predictors flagged through the bolded and underlining methods discussed above (overall results across all five groups of the multigroup analysis are summarized in Table 24).

Table 21. **Guitar-Only Group** (*n* = 329) from Multigroup Unconstrained Model

	Odds Ratio	*SE(B)*
Demographics		
Ethnicity-Race		
Hispanic/White	.791	.320
Black/White	.860	.350
Black/Hispanic	1.446	.234
Male	**1.770**	.208
Former English Language Learner	1.519	.227
Special Education	1.025	.323
Received Free/Reduced Lunch	.925	.224
Academic Achievement		
Ever Gifted	.842	.226
Ever Retained	.898	.312
GPA in 8th Grade	**1.024**	.146
Standardized Reading in 8th Grade	**1.184**	.112
Standardized Math in 8th Grade	.863	.114

Note. Odds ratios and standard errors are from the unconstrained multigroup model (where each predictor was free to vary across the five music groups). Individual path analyses were run to test which individual predictors, when only that path was free to vary across groups, were responsible for improved fit when compared to a nested model where each path was constrained across groups. Underlined predictors show that the path analysis confirmed that this predictor significantly differed across groups ($p < .05$). **Bolded** predictors signified that this predictor significantly predicts any-music persistence ($p < .05$). Odds ratios from the individual path analyses for predictors that are **both bolded and underlined** are discussed in more detail in the text. The above table just shows rough differences within this group, with further-tested significant predictors flagged through the bolded and underlining methods discussed above (overall results across all five groups of the multigroup analysis are summarized in Table 24).

Table 22. **Orchestra-Only Group** (*n* = 458) from Multigroup Unconstrained Model

	Odds Ratio	*SE(B)*
Demographics		
Ethnicity-Race		
Hispanic/White	.794	.202
Black/White	.829	.252
Black/Hispanic	1.056	.216
Male	.850	.133
Former English Language Learner	1.345	.161
Special Education	1.533	.258
Received Free/Reduced Lunch	.960	.145
Academic Achievement		
Ever Gifted	.994	.154
Ever Retained	.880	.307
GPA in 8th Grade	**1.087**	.152
Standardized Reading in 8th Grade	**1.001**	.089
Standardized Math in 8th Grade	1.181	.112

Note. Odds ratios and standard errors are from the unconstrained multigroup model (where each predictor was free to vary across the five music groups). Individual path analyses were run to test which individual predictors, when only that path was free to vary across groups, were responsible for improved fit when compared to a nested model where each path was constrained across groups. Underlined predictors show that the path analysis confirmed that this predictor significantly differed across groups ($p < .05$). **Bolded** predictors signified that this predictor significantly predicts any-music persistence ($p < .05$). Odds ratios from the individual path analyses for predictors that are **both bolded and underlined** are discussed in more detail in the text. The above table just shows rough differences within this group, with further-tested significant predictors flagged through the bolded and underlining methods discussed above (overall results across all five groups of the multigroup analysis are summarized in Table 24).

Table 23. **Multi-Music-Type Group** (*n* = 81) from Multigroup Unconstrained Model

	Odds Ratio	*SE(B)*
Demographics		
Ethnicity-Race		
Hispanic/White	.874	.773
Black/White	.850	.843
Black/Hispanic	.969	.484
Male	**2.430**	.404
Former English Language Learner	1.589	.473
Special Education	.187	1.406
Received Free/Reduced Lunch	.515	.652
Academic Achievement		
Ever Gifted	**.184**	.769
Ever Retained	1.045	.108
GPA in 8th Grade	**2.020**	.562
Standardized Reading in 8th Grade	**1.170**	.252
Standardized Math in 8th Grade	2.014	.528

Note. Odds ratios and standard errors are from the unconstrained multigroup model (where each predictor was free to vary across the five music groups). Individual path analyses were run to test which individual predictors, when only that path was free to vary across groups, were responsible for improved fit when compared to a nested model where each path was constrained across groups. Underlined predictors show that the path analysis confirmed that this predictor significantly differed across groups ($p < .05$). **Bolded** predictors signified that this predictor significantly predicts any-music persistence ($p < .05$). Odds ratios from the individual path analyses for predictors that are **both bolded and underlined** are discussed in more detail in the text. The above table just shows rough differences within this group, with further-tested significant predictors flagged through the bolded and underlining methods discussed above (overall results across all five groups of the multigroup analysis are summarized in Table 24).

Table 24. Predictors of Any-Music Persistence Within Multigroup Model (One Model)

	Band	Chorus	Guitar	Orchestra	Multiple
Demographics					
Ethnicity-Race					
Male			+		+
Former English Language Learner	+	+	+	+	+
Special Education					
Received Free/Reduced Lunch					
Academic Achievement					
Ever Gifted		+			–
Ever Retained					
GPA in G8	+	+	+	+	+
Standardized Reading in G8	+	+	+	+	+
Standardized Math in G8	+	+			

Note. $p < .10$, $p < .05$. + for odds ratio greater than 1; – for odds ratio less than 1. Column names correspond with grouping variables for 8th grade music type (all run within a single model). Rows that have a mixture of orange cells and white cells (e.g., ever gifted) indicate a predictor that significantly varied across groups (displaying moderation). All other rows indicate predictors that acted the same across groups, meaning that rows with orange cells all of the way across (e.g., GPA) display a predictor that matters for any-music persistence regardless of 8th grade music type. All predictors were tested via individual path analyses in order to report the results above.

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