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Influence of Self-regulation and Motivational Beliefs on University Music Students' Use of Practice Strategies

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INFLUENCE OF SELF-REGULATION AND MOTIVATIONAL BELIEFS ON UNIVERSITY MUSIC STUDENTS' USE OF PRACTICE STRATEGIES

by

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Abstract

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The purpose of this study was to determine whether there is a relationship between university music students' self-regulation, motivational beliefs, and background characteristics and the number and kinds of practice strategies used during 30 min of practicing. The research questions used to guide this study were: "After controlling for participants' known background characteristics (age, sex, primary instrument, years of playing, years of private lessons, average hr of practice per week, and training on another instrument), do university music students' self-regulatory abilities, self-perceptions and motivational beliefs (self-efficacy, locus of causal attributions, goal orientation, and implicit talent beliefs) predict the number of practice strategies used during a 30-min practice session?" and "After controlling for participants' known background characteristics (age, sex, primary instrument, years of playing, years of private lessons, average hr of practice per week, and training on another instrument), do university music students' self-regulatory abilities, self-perceptions and motivational beliefs (self-efficacy, locus of causal attributions, goal orientation, and implicit talent beliefs) predict the total kinds of practice strategies used during a 30-min practice session?" Participants in this study were undergraduate music students who played woodwind (n = 20) or brass instruments (n = 20), from three different universities in the mid-South. Results from a multiple regression revealed that participants' self-regulation, self-efficacy, locus of causal attributions, goal orientations, implicit talent beliefs, and background characteristics accounted for 56% of the outcome variable total number of strategies used. The strongest predictor that contributed to the regression model was performance approach goal orientation (β = .57), followed by sex (β = .52), locus of causal

attributions (β = -.52), and self-regulation (β = .38). Results from the second multiple regression revealed that participants' self-regulation, self-efficacy, locus of causal attributions, goal orientations, implicit talent beliefs, and background characteristics accounted for 53% of the outcome variable kinds of strategies used. The strongest predictor that contributed to the regression model was the performance avoid goal orientation (β = .42), followed by primary instrument family (β = .37), self-efficacy (β = -.30), self-regulation (β = .29), and sex (β = .29). Future research and implications for music educators are discussed.

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Chapter 1: Discussion of the Research Problem

Pubilius Syrus said that "Practice is the best of all instructors" (Lyman, 1856, p. 41). Music educators from private instructors to ensemble directors seek the best means of instructing their music students in how to practice. It can be difficult to motivate students to practice in the first place; when students do practice, their practice should be as effective as possible. The negative effects of ineffective practice are that music students may be wasting time that they could be using to increase their musical skills. Additionally, students who put much effort into ineffective practice may become frustrated and stop participating in musical activities. The strategies used by students can impact the effectiveness of musical practice. Researchers have found that how musician practice impacts skill level to a greater degree than the amount of time spent practicing (Duke, Simmons, & Cash, 2009; Hallam, 1998; McCormick & McPherson, 2003; Zurcher, 1975). The results of past studies indicate that music students practice inefficiently and ineffectively (Kostka, 2002; McPherson & McCormick, 2006; Miksza, Prichard, & Sorbo, 2012; Pitts, Davidson, & McPherson, 2000b; Ritchie & Willamon, 2011; Rohwer, 2002; Rohwer & Polk, 2006; Willamon & Valentine, 2000). Students' self-regulation and motivational beliefs may have a powerful impact on musical practice, both on students' willingness to practice and on their practice behaviors, including the use of effective strategies (Austin & Vispoel, 1998; Benton, 2002; Byo & Cassidy, 2008; Cleary & Zimmerman, 2004; Fritz & Peklaj, 2010; Hallam, 2002; Hallam & Shaw, 2002; Lehmann, 1997; McPherson & McCormick, 1999; Nielsen, 2004; Picone, 2012; Schmidt, 2005; Smith, 2005). The theoretical framework of this dissertation is that of self-regulation and the problem of interest is how to increase the effectiveness of music students' practice.

The Purpose of the Study

Although multiple studies have been conducted to examine the nature of the relationship between self-regulation, motivational beliefs, and musical practice, research is scant on the connection between students' observable practice behaviors and whether self-regulation and motivational beliefs can predict those behaviors. While many teachers understand the necessity and difficulty of motivating students to practice and teaching students to practice more effectively, teachers may not know that it is possible to impact students' motivational beliefs and self-regulatory skills. It may be that spending time and effort on developing adaptive learning strategies and motivational beliefs will make it possible to increase students' practice effectiveness. The research problem is that researchers have yet to determine a clear connection between students' self-regulation and what kinds of practice strategies they use. Researchers also have yet to determine a clear connection between motivational beliefs and students' music practice strategies. Therefore, the purpose of this study is to determine whether university music students' self-regulation, motivational beliefs, and background characteristics can predict the number and kinds of practice strategies used during 30 min of practicing.

Significance of the Study

Musicians, both expert and novice, spend a great deal of time and effort to increase musical skills to be able to competently deal with a wide range of musical problems. Musical practice is the primary means of increasing musical skills. It is in the best interests of musicians to determine factors influencing the effectiveness of musical practice – regardless of how much time a musician spends practicing, the time spent should be used wisely. The social-cognitive theory of human behavior may provide a useful structure for examining how and why music students practice. Social cognitive theorists have posited that human behavior is not solely

impacted by environmental influences, but may be primarily driven by self-regulatory systems (Bandura, 1991). Determining to what degree psychological constructs such as self-regulation and motivational beliefs can predict student musicians' use of practice strategies can provide a road map for other musicians as they seek to increase the effectiveness of their practice. Information about students' self-regulation and the influence of self-beliefs on motivation may also guide music teachers seeking to instruct students in the skill of musical practice. Previous research on the topics of musical practice and self-regulation and motivational beliefs' impact on music students demonstrates the interest of the music education research community (Austin, 1998; Bartolome, 2009; Bézenac & Swindells, 2009; dos Santos & Gerling, 2011; Fritz & Peklaj, 2011; Hallam, 2001b; Leon-Guerrero, 2008; McPherson & McCormick, 2006; Mieder & Bugos, 2017; Miksza, 2006b; Nielsen, 2008; Schatt, 2011). Evidence as to the nature of self-regulation and motivational beliefs' influence on the use of practice strategies may assist future researchers in investigating this topic more fully. Rohwer and Polk (2006) called for studies that investigated students' practice behaviors more extensively. Rohwer (2002) thought that future research determining reasons for students' practice strategy choice could be valuable; investigating the degree to which students' self-regulation and motivational beliefs can predict practice strategy use may assist with explaining why music students make certain decisions during practice. Kim (2010) called for studies documenting practice behaviors through video-recording. Byo and Cassidy (2008) indicated that researchers investigating practice may wish to ensure that all participants are practicing music of equal difficulty.

The Method of the Study

To address the research questions, university music students were video-recorded using the iMovie app on a Mac computer while practicing etude 13 from the Watkins-Farnum

Performance Rating Scale for 30 min. They then completed the self-regulation and motivational beliefs scales. Practice videos were coded by the researcher for behavioral evidence of strategy use. Two multiple regressions were used to determine whether students' self-regulation and motivational beliefs predicted strategy usage during a 30-min practice session. The predictor variables were self-regulation, self-efficacy, causal attributions, goal orientation, and implicit beliefs scores. The outcome variables were the total number of practice strategies and total kinds of practice strategies.

The Research Questions

The research questions used to guide this study were:

1. After controlling for participants' known background characteristics (age, sex, primary instrument, years of playing, years of private lessons, average hr of practice per week, and training on another instrument), do university music students' self-regulatory abilities, self-perceptions and motivational beliefs (self-efficacy, locus of causal attributions, goal orientation, and implicit talent beliefs) predict the number of practice strategies used during a 30-min practice session?
2. After controlling for participants' known background characteristics (age, sex, primary instrument, years of playing, years of private lessons, average hr of practice per week, and training on another instrument), do university music students' self-regulatory abilities, self-perceptions and motivational beliefs (self-efficacy, locus of causal attributions, goal orientation, and implicit talent beliefs) predict the total kinds of practice strategies used during a 30-min practice session?

In Chapter 1, I have discussed the research problem, the purpose, significance, method, and the research questions of the study and defined key terms. In Chapter 2 I will examine the

literature concerning self-regulation, musical practice, and motivational beliefs in greater detail. In Chapter 3, I will describe all steps taken to execute the study and, in Chapter 4, I will report the results of the study. In Chapter 5, I will compare the results of the present study to those of previous studies, describe applications of the results, and make recommendations for future research.

Operational Definitions

For the purposes of this study, I will define the following terms.

Causal Attributions: beliefs held by individuals about the reasons for success or failure in a specific situation (Asmus, 1985; Weiner, 1985).

Extrinsic motivation: the desire to perform some task for the sake of external rewards or punishments (Schunk, Meece, & Pintrich, 2002).

Goal orientation: students' motives or rationales for attempting to achieve a specific learning goal. Students' goal orientation can be either mastery (focus on achieving a valued task) or performance (focus on achieving relative to other individuals) oriented; additionally, students can have an orientation of approach or avoidance to their goals (Jones, Wilkins, Long, & Wang, 2012; Schatt, 2011; Schunk et al., 2002).

Implicit beliefs: what students believe about the nature of intelligence or musical talent. Fixed beliefs include the idea that intelligence/musical talent cannot be changed. Growth beliefs include the idea that intelligence/musical talent can be changed through effort and training over time (De Castella & Byrne, 2015; Dweck, Chiu, & Hong, 1995).

Intrinsic motivation: the desire to engage with a task for its own sake (Schunk et al., 2002).

Metacognition: assessment and management of mental operations (Shimamura, 2000).

Motivational beliefs: beliefs held by individuals concerning a task or the self that impact motivation to accomplish the task (Eccles & Wigfield, 2002).

Practice: activities undertaken by musicians to increase musical skill (Hallam, 1997).

Practice strategies: actions taken by music students in order to achieve musical goals; such strategies may have motivational as well as cognitive and behavioral components (Nielsen, 1999). For the purposes of this study, "number of strategies" will refer to the summed number of times participants used strategies during practice sessions. "Kinds of strategies" will refer to the discrete strategies used by participants during practice sessions.

Self-efficacy: the judgments made by individuals about their ability to perform specific tasks (Bandura, 1982; McPherson & McCormick, 2006; Ritchie & Willamon, 2011; Schunk et al., 2002).

Self-regulation: behavior undertaken to achieve a goal (Zimmerman, 2008).

Chapter 2: Review of Literature

This chapter will review the literature and theory connected to self-regulation, musical practice, motivational beliefs, and strategy use. Chapter 2 begins with an overview of research concerning self-regulation in both academic and musical settings. The second section will cover research on musical practice, closing with studies conducted on self-regulation and musical practice. The final section will discuss research on the motivational beliefs of self-efficacy, causal attributions, goal orientations, and fixed/growth beliefs and their impact on musical practice.

Self-regulation

According to social cognitive theorists, self-regulatory systems have a profound effect on human choices and actions (Bandura, 1991). Individuals use self-regulation to control their thoughts, emotions, motivation, and behavior (Bandura, 1991). Self-regulation has been defined as behavior undertaken to achieve a goal (Hofmann, Schmeichel, & Baddeley, 2012; Vohs & Baumeister, 2004; Zimmerman, 2008; Zimmerman & Kitsantas, 1997). Like other metacognitive behaviors, self-regulation is housed in the prefrontal cortex of the brain (Heatherton & Wagner, 2011; Shimamura, 2000). Individuals self-regulate to act on their perceived best interests (Muraven & Baumeister, 2000). For example, a musician who normally has difficulties with punctuality may choose to use strategies such as setting an alarm to arrive at an important performance on time. There is some disagreement among researchers as to whether self-regulation is dependent on the context and tasks of a particular activity such as music (domain-specific) or is a general ability that applies equally to all activities (Desoete & Roeyers, 2002; Martinez, 2005; Sternberg, 1998); however, Zimmerman (1998) has emphatically stated that students' self-regulatory skills are domain-specific. Some students may be better able to self-

regulate in academic subjects because of extensive educational experience; those same students may not possess adaptive self-regulatory skills in learning music. Experts in a domain tend to be better at metacognition in that domain than novices (Lajoie, 2008). One explanation may be that self-regulation and other metacognitive skills are domain general, but that one's skill level in a particular domain will affect how well one is able to implement metacognitive strategies within that domain (Fletcher & Carruthers, 2012; Sternberg, 1998).

As a type of metacognition (thinking about thinking), self- regulation plays a vital role in how humans develop and use skills (Kornell, 2009; Sternberg, 1998). Self-regulated students have been defined as "metacognitively, motivationally, and behaviorally active participants in their own learning" (Zimmerman, 1990, p. 4). In order to be metacognitively active, students must be able to plan, define objectives, organize, supervise, and self-assess the learning process (Zimmerman, 2008). Behaviorally, students interact with their environment by choosing, creating, and arranging the environment to foster their own success (Zimmerman, 2002). A music student who is highly self-regulated may choose to set up a specific practice area free from distractions and with needed resources close to hand. Self-regulation also involves a "self-oriented feedback loop" (Zimmerman, 1990, p. 5), in which students assess how well their strategies are working and make behavioral changes based on that assessment (Zimmerman, 1990). For example, a musician may notice that merely repeating a section of music over and over again did not improve performance of that section and choose to use another strategy. Rather than being a singular personality trait, self-regulation is a set of processes that students choose to use (or not use) in the completion of various learning tasks (Zimmerman, 2008). Self-regulatory behaviors can be directed internally, to alter one's thoughts and attitudes, or externally, to alter the surrounding environment (Zimmerman, 2002). An example of self-

regulating one's internal state would be determining that one is feeling unhappy and choosing to listen to a particular type of music in order to change the emotional state. An example of self-regulating the external environment would be a student choosing to set up a practice space to facilitate more effective practice behaviors.

While useful, metacognitive and self-regulatory skills do require cognitive resources that cannot then be used elsewhere (Bahrami et al., 2012; Proust, 2007). Self-regulation is effortful, so students will not use it unless they believe that the process will benefit them in some way (Zimmerman, 2002). It is easier for music students to mindlessly repeat large sections of music than to think about which specific skills need improvement and choose appropriate strategies. Flavell (1979) listed skills that he believed require metacognition, which includes self-regulation, and many of these skills are important to learning music as well, particularly attention, memory, problem-solving, self-control, and self-instruction. When students are self-regulated, they look for opportunities to learn, to obtain feedback, and to engage in self-evaluation; they tend to be confident, work hard, persist, and actively seek out resources (Zimmerman, 2008). Imagine a highly self-regulated music student who knows that intonation presents difficulties; that student could investigate means of increasing intonation accuracy, ask parents or teachers for feedback, or self-record to determine level of improvement. Declarative knowledge involves recall of facts, while procedural knowledge involves the ability to successfully complete tasks; the use of both types of knowledge requires students to identify missing elements, a process that is effectively facilitated by self-regulation (Zimmerman, 1990). Self-regulation is not dependent on innate ability, and may be a way for less talented students to compensate and reach higher achievements (Zimmerman, 1990). Self-evaluation is essential for students to be able to modify strategies based on how well they have learned material (Zimmerman, 1998). Self-regulation leads students

to believe that they can control educational outcomes and are responsible for their own learning, leading to more adaptive learning behaviors (Zimmerman, 2002). Instead of waiting for ensemble directors or private instructors to say how a particular passage of music should be played, self-regulated music students would be actively assessing the musicality of their performance and seeking ways to perform with more expression. Motivation plays a crucial role in self-regulation, but self-regulation can also be used to impact music students' motivation to practice. The use of self-regulatory strategies can increase students' motivation for engaging in challenging and complex tasks (Zimmerman, 2008). Use of self-regulation strategies such as self-recording may help music students understand how their musical skills have improved over time and thereby fuel those students' desire to improve even more. Training in self-regulation can improve students' self-efficacy, which would then impact their motivation to practice and to persist in musical training (Zimmerman, 2002).

Measuring self-regulation, like other forms of metacognition, presents some difficulties. Metacognitive skills can be difficult to measure because humans are not always conscious of its processes (Fox & Risconscente, 2008; Martinez, 2005). It can be difficult to separate metacognition from domain-specific abilities because many aspects of expertise development depend on metacognition, such as selection of strategies or prediction of difficulty (Sternberg, 1998). It has been proposed that having people talk about their metacognitive understanding would provide a more valid measurement than a rating system (Bahrami et al., 2012). Think-alouds have been a traditional means of assessing metacognitive skills, such as self-regulation (Lajoie, 2008). Memory assessments are also used to test metacognition (Smith & Washburn, 2005). Some commonly utilized assessment methods are self-report questionnaires, observations of overt behavior, interviews, evidence in student work, situational manipulations, recording

student motivation strategies as they work, or keeping diaries (Boekaerts & Cascallar, 2006; Boekaerts & Corno, 2005; Zimmerman, 2008). Miksza (2012) designed a questionnaire for use in assessing music students' self-regulation including questions on self-efficacy, method/behavior combined, time management, and social influences. Students' scores on this scale predicted practice time, practice efficiency, and goal-directed practicing (Miksza, 2012).

Phases of self-regulation. Self-regulation has been divided into three phases in order to more effectively study it: a performance phase involving self-control and self-observation, a self-reflection phase involving self-judgment and self-reaction, and a forethought phase involving task analysis and self-motivation beliefs (Zimmerman, 2008). In order to successfully navigate those three phases, individuals must have standards to measure their behavior by, enough motivation to try to reach those standards, and the ability to achieve their goals (Hofmann et al., 2012; Vohs & Baumeister, 2004). Zimmerman (2002) believed the forethought phase involves task analysis (goal setting, strategic planning) and self-motivation beliefs (self-efficacy, outcome expectations, intrinsic interest/value, learning goal orientation). How a musician plans to prepare for a performance will be impacted by the music selection – a very difficult piece requires more in-depth preparation than an easier one. On the other hand, a more difficult piece may be more intrinsically interesting, therefore motivating the musician to spend more time with it. Zimmerman (2002) described the performance phase as involving self-control (imagery, self-instruction, attention focusing, task strategies) and self-observation (self-recording, self-experimentation). Musicians use slow practice to make sure the memorization of a piece is complete and that the motor skills are automated at every speed, which is an example of a task strategy. The self-reflection phase contains self-judgment (self-evaluation, causal attribution) and self-reaction (self-satisfaction/affect, adaptive/defensive) elements (Zimmerman, 2002). After a

performance, musicians may analyze mistakes for future work and let themselves enjoy the pleasure of having successfully performed for an audience.

Development of self-regulation. Awareness of when students begin to demonstrate self-regulation can assist educators in deciding how best to structure interventions. In looking at the development of metacognition and self-regulation in children, researchers differ on when exactly metacognitive abilities start to appear. Metacognitive abilities, including self-regulation, seem to emerge at around four years of age (Frith, 2012), although some researchers believe that metacognitive evaluation of one's reasoning skills does not develop until adolescence (Fletcher & Carruthers, 2012). It may be that children generally do not view long-term outcomes as being more important than short-term outcomes, which may prevent them from utilizing self-regulation (Zimmerman, 1990). Young children have mistaken beliefs about learning, thinking that more effort is all that is required, and they self-reflect infrequently (Zimmerman, 1990). Individual children do demonstrate differing levels of self-regulatory behavior in the face of challenging tasks (McCabe, Cunnington, & Brooks-Gunn, 2004). Infants demonstrate basic self-regulatory behaviors such as gaze aversion and fussiness, and toddlers can choose strategies to help them delay gratification (McCabe et al., 2004). Preschoolers' inhibitory control improves as they age, using self-distraction and concealment strategies (hiding a forbidden object, for example) to help them achieve goals (McCabe et al., 2004). While young children may display some forms of self-regulation, the frontal lobe matures slowly throughout children's growth to adulthood, and is where executive functions are housed, indicating that children are not able to fully self-regulate (McCabe et al., 2004). Fagnant and Crahay (2011) state that 8 to 10 years is the age range within which metacognition begins to be displayed, although they note that metacognition may surface at younger ages in some students, while other students may never fully develop their

metacognitive abilities. Metacognitive abilities become more sophisticated as students age (Flavell, 1979).

Personality, education, and metacognitive-specific training all affect students' development of metacognitive and self-regulatory abilities (Fletcher & Carruthers, 2012). Students' self-regulatory behaviors can be increased through training, even at the elementary level (Dignath, Buettner, & Langfeldt, 2008). In fact, beginning self-regulation instruction when students are younger can help boost students' self-efficacy for self-regulatory strategy use and impact their causal attributions (Dignath et al., 2008). Interventions work best when rooted in the context that they will be used (Dignath et al., 2008).

Self-regulation tendencies. Individuals possess differing levels of self-regulatory skills, which may be impacted by a variety of influencing factors. People employ a wide variety of metacognitive strategies, including self-regulation, depending on the problem at hand, training, and personality (Fletcher & Carruthers, 2012; Nielsen, 2004). On the other hand, individuals do not always use metacognitive strategies unless prompted to do so (Bathgate, Sims-Knight, & Schunn, 2012). Individual metacognitive assessments of mental imagery tend to correlate with brain activity levels and performance on mental imagery assessments but not with individuals' feelings of mental effort (Pearson, Rademaker, & Tong, 2011). Research suggests that male university music students use critical thinking strategies more than males (Nielsen, 2004). Self-regulation is effortful, so students will not use it unless they believe that the process will benefit them in some way (Zimmerman, 2002). Some university music students may possess superior self-regulatory skills, while others may be more ineffective at identifying and utilizing self-regulatory and practice strategies (Barry, 2007; Nielsen, 2001). Cognitive neuroscience seems to indicate that successful self-regulation requires equilibrium between the prefrontal regions

activated by metacognition and the subcortical regions activated by rewards (Heatherton & Wagner, 2011).

Individual psychological traits contribute to self-regulatory success (Heatherton & Wagner, 2011; Koo & Fishbach, 2008; Mischel & Ayduk, 2004). Self-efficacy, intrinsic task interest, and causal attributions play important roles in students' motivation to be self-regulated (McCabe et al., 2004; Zimmerman, 1990, 2002). Unpredictable, random internal events such as fatigue, emotional distress, or a large cognitive load can affect self-regulation either positively or negatively (Heatherton & Wagner, 2011; Hofmann et al., 2012). Although the specific occurrence of these internal events may be unpredictable, the fact that such events will occur is not. Persons attempting to self-regulate may expect to experience stress or fatigue at some point. External factors can also impact how successfully an individual can self-regulate (Baumeister & Heatherton, 1996; Mikulincer, Shaver, & Pereg, 2003). While some of these factors are difficult to anticipate, others lend themselves well to strategizing. Education can increase awareness of how to deal with environmental factors, stressors, or high stakes situations.

Self-regulatory strategies and skills. Zimmerman (2002) lists several self-regulatory skills: setting specific proximal goals, adopting powerful strategies to reach the goals, monitoring performance, restructuring the physical and social context to more effectively reach the goals, efficiently managing time use, self-evaluating the chosen strategies and methods, attributing causation to results, and adapting future methods based on whether the goals were met or not. In learning a second language, while students used a variety of strategies, it appears that the strategies themselves were less important than how students chose to deploy the strategies through metacognitive thinking (Sternberg, 1998). Theories of self-regulation attempt to determine what prompts students' use of various strategies and how those strategies are

implemented (Zimmerman, 1990). Self-regulation involves the use of cognitive strategies (used to monitor and control learning) and self-regulatory processes, both of which contribute to students' music learning (McPherson & McCormick, 1999). Self-regulation strategies are rarely taught in formal school settings; Randi and Corno (2000) created a list of self-regulation strategies that students can use to facilitate learning: planning ahead, making lists of steps and tasks, managing time, scheduling tasks wisely, doing one task at a time, setting small goals, reviewing material, asking for outside evaluations, thinking about long-term goals, setting priorities, envisioning the final product, using implementation intentions, imagining the achievement of goals, thinking positively, staying on task, using help from outside experts, modifying the environment, and having materials ready. Randi and Corno (2000) were examining the effect of self-regulation instruction on a high school literature class, but these strategies may also be appropriate to musical learning.

Goal setting is an important element of self-regulation. Students' goals could be either outcome oriented or process oriented (Zimmerman & Kitsantas, 1999). In acquiring motor skills such as those crucial to making music, it may be more effective for students to start with process goals and gradually shift to outcome goals as they become more skilled (Zimmerman & Kitsantas, 1999). Novice learners are unable to effectively achieve outcome goals because they do not have enough domain-specific experience and knowledge to self-evaluate and adjust (Zimmerman & Kitsantas, 1999). Focusing on process goals is less cognitively demanding and more effective for novice learners (Zimmerman & Kitsantas, 1999). Expert learners have already mastered the fundamental processes, so they benefit more from focusing on outcome goals to optimize individual success (Zimmerman & Kitsantas, 1999). Adjusting the type of goal to learners' level of skill will result not only in greater achievement, but also in higher self-efficacy,

motivation, and task interest (Zimmerman & Kitsantas, 1999). Goals can also be prevention or promotion focused (Higgins & Spiegel, 2004). Self-regulation focused on prevention of negative outcomes results in more attention to accuracy, is more motivated by failure, and is achieved through vigilance-related methods (Higgins & Spiegel, 2004). Promotion focused self-regulation is more concerned with achieving positive goals, results in attention to increasing the number of positive "hits," is more motivated by success, and is achieved through eagerness-related methods (Higgins & Spiegel, 2004). Matching regulatory focus to specific goals will result in more effective self-regulative strategies (Higgins & Spiegel, 2004).

Self-regulation instruction. The study of self-regulation has many practical applications, as it is the mechanism that lets individuals put aside differences to work together, choose to achieve important goals, and sustain healthy lifestyles (Cleary & Zimmerman, 2001; Fishbach, Zhang, & Koo, 2009; Heatherton & Wagner, 2011; Mikulincer et al., 2003). Researchers focusing on addictions, education, affect regulation, and psychotherapy have found self-regulation a useful construct to study (Baumeister & Heatherton, 1996; Mikulincer et al., 2003; Vohs & Baumeister, 2004; Zimmerman, 2002; Zimmerman & Kitsantas, 1999). Successful self-regulation can result in more harmonious interpersonal relationships, improved mental health, reduced incidences of maladaptive behaviors, and greater job achievements (Heatherton & Wagner, 2011).

Self-regulatory processes are typically not taught in academic settings despite the positive impact on students' achievement and self-efficacy (Zimmerman, 2002). It is not enough for students to know about strategies that will help them to achieve more; they must also be taught how to assess their progress and decide when to use the strategies (Fritz & Peklaj, 2011; Martinez, 2005; Sternberg, 1998; Zimmerman, 2002). The use of metacognitive skills such as

self-regulation can be difficult and unfamiliar for students, so teachers will need to demonstrate the usefulness of metacognition to students (Martinez, 2005; Sternberg, 1998). Some teachers may not teach self-regulation or other metacognitive skills because they do not know what those skills are or how to foster them in students (Sternberg, 1998). Student musicians do engage in self-regulation; they may just need guidance in developing more sophisticated and effective strategies (Leon-Guerrero, 2008; McPherson & Renwick, 2001).

Educational researchers have investigated means of positively impacting students' metacognitive skills; since self-regulation is a type of metacognition, many of the strategies can apply to improving students' self-regulation, as well. To better develop students' self-regulation and other metacognitive skills, Martinez (2005) recommends that students be given opportunities to use metacognition, to see metacognition modeled by teachers, and to develop their metacognitive skills through peer interactions. Teachers can model the use of self-regulation strategies for their students and provide information on external resources that students can draw on to facilitate their learning (Randi & Corno, 2000). Teachers may want to examine which metacognitive skills students are having trouble with and modify instruction accordingly (Desoete & Roeyers, 2002; Saldaña, 2004). Quality feedback is a crucial aspect of developing self-regulation; while the end goal is enabling students to self-assess their performance independently, to begin with teachers may have to support students' self-evaluations with teacher evaluations (Randi & Corno, 2000). Thinking guides that list specific strategies for students can be helpful for students (Randi & Corno, 2000). For example, music students could have lists of practice strategies to use when encountering specific problems to keep in music folders and at home. Explicit transfer instruction helps students use strategies in multiple contexts (Randi & Corno, 2000). An ensemble director could make explicit the decision process used in

determining expressive elements in a piece of music and then guide students in using that same process when practicing a solo musical piece. Randi and Corno (2000) describe the type of classroom that facilitates self-regulation development: opportunities for student choice, challenging environment, community building, instruction in collaborative skills, direct and scaffolded instruction in strategy use, self- and peer-evaluations in addition to teacher evaluations, and instruction in how to choose goals. Computer programs may provide another means of developing students' metacognitive abilities (Lajoie, 2008).

Teachers can foster student self-regulation by giving students more choices in assignments, strategies, and learning environment, by encouraging specific goal setting, and by giving students opportunities to self-evaluate (Zimmerman, 2002). Interventions implemented consistently over long periods of time may be more effective than short-term or one time only interventions (Picone, 2012). Questioning – particularly that which fosters inductive reasoning and evaluation on the part of the student - is an effective means of increasing students' self-regulation in music performance/practice (Picone, 2012). Picone (2012) recommended using questioning, recording the student, and guided evaluation of recorded practice sessions to increase student musical self-regulation. The TARGET program might provide a structured approach for music teachers seeking to facilitate student self-regulation (Boekaerts & Corno, 2005). It focuses on teachers' use of task selection, authority, recognition, grouping methods, evaluation practices, and time allocation (Boekaerts & Corno, 2005).

An important element of self-regulation is the choice of strategies in response to goals and challenges. The choice of strategy to reach a learning goal is impacted by whether students are using goal intentions or implementation intentions (Golwitzer, Fujita, & Oettingen, 2004). Goal intentions are focused on the goal, whereas implementation intentions are conditional

statements (Gollwitzer et al., 2004). For example, a music student may have the goal implementation of practicing for an hr per day, and the implementation intention of "when I come home from school, I will go to my room and practice before dinner." Implementation intentions deal with contingencies, deciding in advance which goal obstructions may be encountered and what the learner's response will be; they positively impact response speed, efficiency, and goal commitment (Gollwitzer et al., 2004). The use of implementation intentions can increase the likelihood of self-regulatory success (Golwitzer et al., 2004). Due to their reduction of cognitive load, implementation intentions can positively impact response speed, efficiency, and goal commitment during the self-regulation process (Gollwitzer et al., 2004).

Musical benefits of self-regulation. Self-regulation positively impacts the ability and motivation to learn music and is needed to engage in such an effortful activity as musical training (McPherson & McCormick, 1999; Zimmerman & Kitsantas, 1999). Self-regulation was predictive of beginning instrumental students' musical achievement (McPherson & McCormick, 1999; McPherson & Renwick, 2001). Experts use various self-regulatory strategies to improve the effectiveness of their practice and to increase motivation for engaging in musical practice. In fact, experts tend to use more self-regulatory strategies, set specific goals, and choose strategies during practice sessions more than non-experts or novices (Cleary & Zimmerman, 2001). Self-regulatory skills enable musicians to use resources and overcome obstacles in meeting their goals for performance (Nielsen, 2001). Santos and Gerling (2011) found that the university piano student with the highest-ranked performance also utilized more self-regulation strategies than other participants. Instruction in metacognition positively impacted music students' performance ratings (Bathgate et al., 2012). Middle school band students' skill in evaluating their musical performance improved when their band director began implementing metacognitive activities

(Bauer, 2008). Predictive and evaluative skills are required for composers as well as performers (Cook, 1998). Junior high students who engaged in metacognitive activities associated with sight-reading made higher scores on the written sightreading test and felt more positively about sightreading than did peers who did not engage in metacognitive activities, although the activities did not seem to improve sightreading performance (Benton, 2002). University students enrolled in musicianship classes were given training in a variety of metacognitive strategies (Egan, 1995). These students' post-test scores on the Achievement Test of Musicianship were significantly higher than their pre-test scores, indicating that training in metacognitive strategies can help improve students' musicianship (Egan, 1995). Self-regulation may not necessarily lead to high levels of musical expertise, since it depends on the goals that students set for themselves (Bézenac & Swindells, 2009).

Musical Practice

Music as a domain provides the opportunity for humans to participate in a pleasurable and cognitively engaging activity. Competent participation in musical activities requires an intricately connected set of complicated skills – acquiring these skills takes in-depth instruction and many hr of practice (McPherson & McCormick, 2006; Zimmerman & Kitsantas, 1999). Many cultures value musical participation; in American culture, most adults engage in musical activities in some way every day, whether through creating, performing, or listening. American culture values musical skills highly enough that music education is often part of the public education system. Many expert musicians are able to gain full-time employment through public performances and instruction of future musicians. Since musical skills are valued so highly, researchers have examined mechanisms for acquiring those skills.

The primary mechanism for developing expertise appears to be practice, but simply spending time engaging in musical activity is not enough. For example, a musician may encounter an extended chromatic passage perhaps once in a piece of music. To improve one's ability to quickly and accurately perform chromatic passages, a musician must spend extended amounts of time working on scales – much more time than is required by one passage in a piece of music. Effective practice involves assessing one's progress, organizing practice (spending more time on difficult pieces, picking out technically demanding passages, etc.), and staying cognitively engaged (McPherson & McCormick, 1999). Effective practice is a skill that music students must develop (Pitts, Davidson, & McPherson, 2000a). Teachers play an important role in motivating students to engage in the effortful work of musical practice (Bézenac & Swindells, 2009). Unlike most academic activities, musical practice occurs largely unsupervised by the teacher; this lack of supervision may lead to undesirable practice habits (Pitts, Davidson, & McPherson, 2000a). Due to the absence of the teacher during practice, the development of students' self-evaluative abilities is crucial (Pitts, Davidson, & McPherson, 2000a). Effective practice involves the improvement of specific tasks, typically chosen by an instructor and is achieved through repetition and refinement (Ericsson & Charness, 1994). Musicians who practice a variety of musical skills tend to exhibit greater cognitive engagement and intrinsic motivation (McPherson & McCormick, 1999).

Benefits of practice. When students work on structured activities with clearly defined goals, monitoring performance to see if those goals have been met, they are engaging in deliberate practice (Lehmann & Ericsson, 1997). Deliberate practice is neither inherently enjoyable nor extrinsically rewarding, but it provides many benefits for musicians. Students who engage in deliberate practice perceive their practice sessions to be more efficient (Miksza,

2006b). Deliberate practice, in addition to environmental factors, predicts performance achievement (Jorgensen, 2002; Lehmann & Ericsson, 1997). Musical practice can enhance individuals' working memory capacity (Bergman-Nutley, Darki, & Klingberg, 2013). Hallam (2004) found that the level of expertise achieved by primary and secondary music students was significantly predicted by the students' self-report of time spent practicing and the length of time the students had been studying their instrument. Quality of performance (as measured by examination marks) was significantly predicted by musical self-esteem, instructors' ratings of students' musical ability and students' involvement in extra-curricular musical opportunities (Hallam, 2004). Extended practice allows experts to avoid the limits of short term memory by storing more information in long term memory, resulting in a qualitative difference in memory performance between experts and novices (Ericsson & Charness, 1994). Anticipation plays a vital role in experts' ability to quickly respond to demands in the environment (Ericsson & Charness, 1994). Musicians' ability to accurately sight-read depends on anticipation and ability to look ahead of where they are actually performing (eye-hand span), which can be improved through deliberate practice (Ericsson & Charness, 1994).

Characteristics of student practice. Many music educators lament the lack of time that their students spend in practicing music. Kostka (2002) found that music educators may have unrealistic expectations for the amount and methods of practice that their students engage in. Music teachers expected their students to practice one-third as much as the students were actually practicing (Kostka, 2002). Less than half of the students were following some sort of practice plan while most of the teachers expected that students were engaging in structured practice (Kostka, 2002). Music teachers also had more positive attitudes toward practicing than students (Kostka, 2002). Impending performances and competitions seem to motivate music

students to practice more. High school instrumental students increased the amount of practice time two weeks prior to an All-State tryout (Rohwer, 2002). Interestingly, while the middle-ranked performers did practice significantly longer than low-ranked performers, the highest-ranked students did not practice significantly longer than the low-ranked students. Evidently, rather than spending more time in practice, the highest-ranked performers used specific practice strategies to a significantly greater degree than the other students, namely practicing with a metronome, alternating slow practice with at-tempo practice, and changing rhythms to work on technical difficulties. Rohwer and Polk (2006) identified four categories of musicians based on practice strategies used: holistic, noncorrective practicers (musicians who played all the way through the music); holistic, corrective practicers (musicians who played through the music but stopped for mistakes); analytic, reactive practicers (musicians who played through the music but stopped to work on sections of the music; and analytic, proactive practicers (musicians who focused on problematic sections of the music). Analytic practicers showed greater improvement in performance achievement than the holistic practicers.

Middle school band students tended to focus on pitch accuracy during practice to a much greater degree than either dynamics or rhythmic accuracy (Miksza et al., 2012). About half of the middle school participants engaged in irrelevant playing during the practice session (Miksza et al., 2012). Students who spend more time practicing overall tend to spend a greater percentage of time on formal practice than informal practice (McPherson & McCormick, 2006). Less experienced musicians may tend to focus on issues of physical execution during practice, while more experienced musicians utilize a variety of strategies to meet demands of musicality as well as technique (Hallam, 2001a; Willamon & Valentine, 2000). Middle school band students tended to spend more time practicing a specific passage at the beginning of the practice session; all

students focused on sections of music eight measures or longer, with less than half of the students practicing music in smaller chunks (Miksza et al., 2012).

Music practice strategies. While a commonly held belief is that more time practicing results in improved performance, the results of multiple studies indicate that amount of time spent practicing is not the best predictor of musical achievement (Hallam, 1998). The number of years spent learning music, self-efficacy, and number and kind of strategies used predict musical achievement better than amount of practice (Duke et al., 2009; Hallam, 1998; McCormick & McPherson, 2003; Zurcher, 1975). Nielsen (1999) defined learning strategies as actions taken by students in order to achieve learning goals; such strategies may have motivational as well as cognitive and behavioral components. Performance achievement correlated positively with collegiate wind players' use of multiple practice strategies, and strategic practicing had a greater impact on performance achievement than time spent practicing (Miksza, 2011). Duke et al. (2009) found that the number of strategies used by musicians was more predictive of performance achievement than how much or how long they practiced. Instrumental students' ability to talk about practice strategies was positively correlated with improvement in performance (Rohwer & Polk, 2006). Piano students' amount of practice did not correlate with ratings of performance achievement, although the more accomplished pianists did spend more time practicing (Willamon & Valentine, 2000). The use of cognitive strategies predicted more time spent in formal practice amongst student musicians preparing for an examination (McPherson & McCormick, 2006). Instrumental students reported that using a variety of strategies increased their ability to play fluently, learn music quickly, improve technique, and play from memory (da Costa, 1999). Instrumental students reported that, after using structured

practice techniques incorporating a variety of practice strategies, teachers, parents, and they themselves were able to perceive a positive impact on performance ability (da Costa, 1999)

Researchers have investigated music students' use of strategies, since improving strategy use seems to positively impact the effectiveness of musical practice. Practice strategies can be categorized into levels of complexity using the length of music focused on (least complex strategies focus on notes, most complex strategies focus on phrases), the degree to which practice is organized, the degree to which outside resources are utilized, and whether the musician can make meaning from the notes on the page (St. George, Holbrook, & Cantwell, 2012). Strategies can also be categorized by students' learning goals; practice strategies may be used to focus on important information or problem areas, to connect segments of the music into a larger whole, to associate prior learning with current challenges, and to classify the challenges of the music to be practiced (Nielsen, 1999). Student musicians who report using more cognitive strategies during practice tend to not only practice more than the students who use fewer cognitive strategies but also practice more efficiently and report greater intrinsic motivation (McPherson & McCormick, 1999). Structured and organized practice procedures tend to result in more efficient skill acquisition (Barry, 1992). The highest achieving university musicians were able to immediately identify mistakes and choose effective strategies (Duke et al., 2009). Similarly, McPherson (1997) found that the highest performing secondary music students exhibited the use of varied and well-chosen strategies as well as metacognitive ability.

Nielsen (1999) conducted a case study of two university organ students and found that these students utilized a variety of practice strategies such as varying the tempo, playing hands separately, repeating sections of the music, and altering musical elements. Hallam (2001a) found that primary and secondary music students' strategy use correlated more strongly with students'

level of expertise than with their age or performance achievement scores. Nielsen (2004) found that university music students use strategies during practice, focusing more on cognitive and metacognitive strategies than resource management strategies. Rehearsal, elaboration, critical thinking, and metacognitive strategies were used more frequently than organizational, environment management, time management, effort regulation, peer learning, and help seeking strategies. Instrument group and degree program seemed not to impact students' use of strategies (Nielsen, 2004). The most common practice strategy observed among university student participants in Barry (2007) was slow practice, whether of the entire piece or just of hard sections; generally, students' practice sessions were observed to be ineffective and contained few strategies. High school students auditioning for a state competition tended to use the strategies of starting music at a slower tempo then gradually increasing tempo, writing in the music, and warming up before practice (Rohwer, 2002). The high school students rarely used the strategies of recording and listening to performances, writing down practice goals, and beginning practice of a piece at the indicated tempo (Rohwer, 2002). Strategies to develop aural modeling of a piece, such as singing, listening to a recording, and recording themselves, were less frequently used by high school students than tempo-related, planning, rhythmic, and environmental/physical strategies. Byo and Cassidy (2008) found that while university music students were able to identify optimal practice strategies, the students rarely implemented those strategies in an effective way.

In order to determine characteristics of effective musical practice, researchers have investigated musical experts' use of deliberate practice techniques. It may be possible for student musicians to incorporate these strategies into their own practice sessions, increasing the effectiveness of student musicians' practice. During deliberate practice, musical experts repeated

longer sections than non-experts, performed at tempo earlier, and verbalized more while beginning a new piece (Lehmann, 1997). While practicing, experts typically start by reading through the entire piece to get a sense of the music as a whole, and then move on to technical work on smaller sections (Lehmann & Gruber, 2006). While working in the smaller sections, musicians are simultaneously automating motor movements and memorizing the music (Lehmann & Gruber, 2006). Expert musicians then go on to work out the stage performance – duplicating performance conditions, creating a mental map of the music, implementing contingency plans for memory lapses or other performance issues, engaging in slow playing, and performing for a "fake" audience (Lehmann & Gruber, 2006). Musicians commonly are required to be able to perform a piece many times after the initial performance, so the last stage of practice involves the maintenance of a piece (Lehmann & Gruber, 2006). Expert musicians schedule their time so as to maximize the effectiveness of practice, spending most of their practice time in the morning (Ericsson & Charness, 1994).

Students are not born knowing how to practice; they will have to be taught effective practice habits and strategies (Bathgate et al., 2012; da Costa, 1999). Younger, less experienced musicians may not even consider choosing different strategies for practice (da Costa, 1999). Effective practice may require a teacher who can help the student identify problems and choose solutions (Hallam, 2001a). Means of supporting effective habits in students' at-home practice sessions have been investigated (Picone, 2012; Zurcher, 1975). Zurcher (1975) found that providing students with a recorded model and recorded instructions for at-home practice positively impacted students' performance achievement to a greater degree than traditional practice methods. Strategy use in musical practice seems to be dependent on the ability to recognize errors and predict difficulties in passages to be practiced (Hallam, 2001a). Mieder and

Bugos (2017) found that students thought that they were using more practice strategies following participation in a self-regulated learning practice strategies curriculum, even though judges' observations indicated that actual use of practice strategies did not significantly increase. Hallam (2001a) found discrepancies between what strategies primary and secondary music students said they were using during practice and the strategies that the students were recorded using during practice. Students appear to more readily implement strategies that instructors have modeled and asked the students to do, as opposed to strategies that are only discussed in lessons (Barry, 2007). Barry (2007) found that students did not utilize all the practice strategies endorsed by their teachers but that strategies practiced during lessons were most likely to be used in students' practice. Music educators can help students practice more efficiently by providing a structure for practice sessions. When high school instrumental students used a structured approach to practicing, they were able to correct more performance errors than students who were freely practicing (Barry, 1990). This held true whether the practice structure was designed by a teacher or by the students themselves (Barry, 1990). Asking college music students to keep track of how often they were distracted during practice sessions had a positive impact on their concentration and performance achievement (Madsen & Geringer, 1981). Simply knowing about practice strategies is not enough, however; students must be able to choose and implement strategies based on the musical tasks in front of them (St. George et al., 2012).

Self-regulated Musical Practice

Musical practice can be a difficult task to undertake, especially for young musicians working on their music in isolation. Self-regulatory abilities would certainly seem to play a role in the development of music students' effective practice strategies. Effective practice involves assessing one's progress, organizing practice (spending more time on difficult pieces, picking out

technically demanding passages, etc.), and staying cognitively engaged; all of these skills involve self-regulation (McPherson & McCormick, 1999). Picone (2012) described effective practice as active learning involving the use of metacognition and self-regulatory strategies. Metacognition, including self-regulation, is considered an aspect of musical ability (Hallam & Shaw, 2002). The complex cognitive demands of musical performance require metacognition in identifying the techniques to use for specific musical difficulties, choosing appropriate strategies, and evaluating progress toward performance readiness (Hallam, 2001b; Lehmann, 1997). Practicing music mentally is a technique used by highly self-regulated music students (McPherson & McCormick, 1999). Metacognition and self-regulatory behaviors are especially important in musical practice as more effective metacognitive strategies allow musicians to put their practice time to the best use (Bathgate et al., 2012; Hallam, 2001b; Nielsen, 2004). Professional musicians use metacognitive skills such as self-regulation in all aspects of performance practice and the metacognitive strategies that individual musicians use vary widely (Bathgate et al., 2012; Hallam, 2001b).

Byo and Cassidy (2008) noted that university music students who diligently worked on small sections of music until performance issues were resolved (a self-regulatory behavior) seemed to demonstrate more musical growth than students who played through the music multiple times, stopping to work on problems in a desultory manner. Metacognition instruction correlated with higher performance ratings for students, even though practice times did not differ (Bathgate et al., 2012). Different musical elements (e.g., tempo, pitch/rhythmic accuracy, expression) may require different degrees of self-regulation in practice; university music students may have more difficulty self-regulating practice of musical expression than of pitch or rhythm

accuracy (Santos & Gerling, 2011). Students' level of self-regulation correlated strongly with the number of different practice strategies they used during session (Miksza et al., 2012).

Researchers have investigated the impact of specific self-regulation strategies on music students' performance achievement and practice effectiveness. The forethought process of the self-regulation cycle includes goal setting, strategic planning, and the beliefs and attitudes that students bring to the learning task (Cleary & Zimmerman, 2004). Planning is important because it promotes effective problem solving, increases motivation, enables learning, lets students respond to changing circumstances, and facilitates collaboration (Mumford, Schultz, & Van Doorn, 2001). The performance phase of the self-regulation cycle involves self-observation and self-control (Cleary & Zimmerman, 2004). Self-control is used to direct one's own learning through self-instruction, imagery, attention focusing, or task strategies (Cleary & Zimmerman, 2004). Self-observation is how students monitor progress and may be accomplished through practicing in front of a mirror, diaries, recordings, etc. The self-reflection phase of the self-regulation cycle involves self-judgments and self-reaction, which guide students' future learning choices (Cleary & Zimmerman, 2004). Self-judgment requires self-evaluation and causal attributions – a decision on whether the goal was achieved and reasons for success or failure (Cleary & Zimmerman, 2004). Self-reactions include satisfaction and adaptive inferences, which both motivate and help students to decide what to change in further learning tasks (Cleary & Zimmerman, 2004). Feelings of satisfaction or frustration after a performance or a practice session can provide students with information on whether different choices need to be made during the next performance or practice session. Self-recording can improve students' skills and their self-efficacy; this fits with Zimmerman's model of the self-oriented feedback loop (Zimmerman & Kitsantas, 1999). Self-recording alone can improve student performance on

academic tasks, perhaps through simply increasing student awareness (Zimmerman, 2002). Self-recording may not positively impact student musicians' self-evaluation accuracy, however (Summitt & Fisher, 2016). Students may be more motivated to use practice strategies with pieces they enjoy performing (Picone, 2012). High school wind students' performance achievement correlated most highly with the strategies of practicing whole-part-whole, skipping to crucial or difficult parts of the music, and repeating sections of the music (Miksza, 2007).

Researchers have investigated the self-regulatory behaviors that students already engage in. There are some differences between expert and student musicians in the use of metacognition. Novice music students are not always cognizant of mistakes and weaknesses and therefore do not know they need to employ different strategies (Bathgate et al., 2012). Novice musicians do seem to use metacognitive strategies while practicing for performance, just not as extensively as professional musicians (Bathgate et al., 2012; Hallam, 2001b). Third-grade recorder students have demonstrated the use of a wide variety of self-regulation strategies while practicing recorder (Bartolome, 2009). McPherson and Renwick (2001), however, found that while beginning instrumental students use learning strategies, they primarily rely on repetition or playing all the way through their music. This discrepancy may be a reflection of the cognitively demanding nature of self-regulation – perhaps easier tasks (playing recorder) permit students to use more cognitive resources for self-regulation than more demanding tasks (playing a wind instrument). When practicing, middle school band students higher in self-regulation were more likely to vary the tempo, repeat more than four measures, and write on their music, and were less likely to engage in off-task playing (Miksza et al., 2012). Middle school band students who scored higher on a measure of musical self-regulation tended to use more practice strategies than students lower in self-regulation (Miksza et al., 2012). Kim (2010) found that university music

students at a New York summer music camp displayed an array of self-regulated practice strategies, from planning out practice sessions to developing aural models of practice pieces to self-evaluation. Adolescent music students also reported using repetition most frequently (Leon-Guerrero, 2008). An examination of adolescent musicians' video-recorded practice sessions revealed that the students used the following strategies: studying the music, fingering, vocalizing, kinesthetic strategies, repeating measures, repeating a measure multiple times, restarting a measure, restarting a measure multiple times, repeating one beat, repeating a measure or group of notes at differing tempos, playing a segment backwards, using a pencil, and repeating segments longer than a measure (Leon-Guerrero, 2008). High school wind students most frequently used the music learning strategies of repeating measures or sections and marking their music (Miksza, 2007).

Metacognition and creative reflection do not always automatically happen; student musicians typically have to be encouraged to use metacognitive thinking (Cook, 1998). Students do not simply acquire metacognition skills even though many music teachers believe their students know how to implement metacognitive strategies; instruction must be very plain and detailed for beginning musicians (Bathgate et al., 2012). Beginning instrumental students in particular may experience difficulty in identifying errors due to the high cognitive load they encounter as a result of having to learn to play an instrument and read music at the same time (McPherson & Renwick, 2001). Music students, particularly beginning musicians, tend not to plan out practice sessions (Leon-Guerrero, 2008). For example, students frequently re-start measures during practice without considering the underlying difficulty that made them stop; evaluation of that strategy might lead students to consider more effective means of solving the performance issue. Music educators often expect that students will enjoy practicing their

instrument as successful classical musicians do – analytically, strategically, and deliberately (Smeltz, 2012). But the most efficient means of practicing may not be the most enjoyable. It may be easier for music students to self-regulate some aspect of musical practice than others. University piano students spent a greater amount of time describing their self-regulation in terms of practice methods rather than the dimensions of behavior or social/cultural factors (Santos & Gerling, 2011). While students may depend on instructors to identify and solve musical problems, university piano students did not tend to use the self-regulation strategy of searching for external resources (Dos Santos & Gerling, 2011). For university music students, it may be that self-regulation of behavior has a greater impact on performance achievement and practice efficiency than self-regulation of the dimensions of time, method, or social/cultural factors (Dos Santos & Gerling, 2011).

It can be difficult to impact students' practice behaviors. Teachers play an important role in motivating students to engage in the effortful work of musical practice (Bézenac & Swindells, 2009). In order to practice effectively, students require specific feedback, appropriate goals, and the ability to monitor performance (Lehmann & Ericsson, 1997). Picone (2012) determined that students' motivation and ability to use self-regulatory practice strategies increased with guided practice sessions. These practice sessions consisted of the teacher providing various practice strategies, listening to students verbally assessing the performances, and guiding students to make effective practice decisions. Pre-intervention assessments of students indicated that the students sometimes evaluated mistakes correctly, but were unable to match mistakes to the best strategy; students tended not to use resources provided for their assistance (Picone, 2012). Prior to treatment, students tended to play through whole pieces when practicing, with errors being infrequently corrected. Post-intervention, students were able to identify, evaluate, and strategize

problematic sections in their music. Students were instructed in the use of effective practice strategies such as silently examining the piece prior to practice, identifying difficult sections prior to practice, using syllables or clapping to rehearse rhythms, playing at a slower tempo, playing hands separate (for pianists), playing small sections of the music repeatedly, connecting small sections of the music to form a larger whole, using extra-musical devices (metronome, recordings), cognitive strategies (e.g., utilizing rests to look ahead in the music) and starting with difficult sections instead of the beginning. After multiple guided practice sessions over the course of a school year, students were able to demonstrate increased use of practice strategies, as well as an increased ability to stay focused during practice; frequency and duration of practice sessions did not necessarily increase (Picone, 2012).

To improve music students' practice effectiveness, Byo and Cassidy (2008) recommended that teachers consider training students to recognize and choose appropriate performance issues to practice, to discriminate between short-term and long-term musical goals, to choose practice approaches based on the demands of the music, to plan practice sessions based on their goals rather than routines, to develop aural models of the music, and to practice as though in front of an audience. Practice diaries may be a means of impacting students' self-regulation of practice behaviors (Kim, 2010). Mieder and Bugos (2017) implemented a self-regulated practice strategy curriculum with high school instrumentalists covering three types of practice strategies: eliminating elements, thoughtful repetition, and increasing musical expressivity. Results indicated that the students' self-efficacy scores and perceived use of practice strategies increased significantly (Mieder & Bugos, 2017). Specifically, students indicated that they thought they were using more practice strategies related to element elimination and thoughtful repetition, while there was no significant increase in perceived use of

practice strategies to develop expressive musical performance (Mieder & Bugos, 2017). Additionally, there was no significant increase in students' performance achievement scores or in judges' observations of practice strategy use (Mieder & Bugos, 2017).

Metacognitive instruction in the three phases of self-regulation (planning, performance, self-reflection) may impact students' practice effectiveness, resulting in improved performance (Bathgate et al., 2012). Planning requires the ability to set goals and choose activities appropriately (Mumford et al., 2001). An understanding of how long activities will take enables the planner to prioritize in relation to goals that have been set (Mumford et al., 2001). Students commonly have unrealistic expectations for how long achievement of musical goals will take, expectations that could perhaps be tempered by their teachers. Students need to be able to decide which goals should take top priority and which are less important (Mumford et al., 2001). Goals should be specific results that students want to achieve, while planning should involve strategy choice to fully realize those goals (Cleary & Zimmerman, 2004). How a musician plans to prepare for a performance will be impacted by the music selection – a very difficult piece requires more in-depth preparation than an easier one. However, the more difficult piece may be more intrinsically interesting, therefore motivating the musician to spend more time with it.

When implementing strategy interventions, teachers should encourage students to evaluate the results to develop a sense of which strategies work better under which circumstances (Leon-Guerrero, 2008). Teachers can help students to use effective strategies during practice through demonstration and modeling (McPherson & Renwick, 2001). To increase students' use of effective strategies in a manner that would foster intrinsic motivation, Smeltz (2012) brainstormed various practice strategies with her middle school students and posted those strategies on the band room wall, then discussing and modeling these practice strategies with her

students. Instead of asking students to spend a specific amount of time or to work on a specific piece for a test, Smeltz suggested to her students that they try to use at least five different strategies during the course of a practice session, and she found that her students' enjoyment of practicing did not diminish (Smeltz, 2012). Mental contrasting is the process of imagining both a desired future and obstructions that will sabotage that future (Duckworth, Grant, Loew, Oettingen, & Gollwitzer, 2011). When mental contrasting is used in conjunction with implementation intentions, students are able to maintain goal pursuit in the face of self-regulatory obstacles (Duckworth et al., 2011). Students must perceive the obstacles as merely being in the way of the future they want, rather than being impossible to change (Duckworth et al., 2011).

Educators can encourage self-reflection and self-evaluation on the part of students through questioning (Picone, 2012). Guided practice sessions can inspire students to think more reflectively about how they practice (Picone, 2017). Students can reflect on performances through the use of self-recording and self-listening (Summitt & Fisher, 2016). Graphing performance achievements with the strategies used to prepare for performances can be an enlightening experience, especially for students with a fixed view of intelligence or musical talent (Zimmerman & Pons, 1986).

Some other strategies music educators may want to use to encourage metacognition are encouraging students to ask questions, requiring students to talk about why they chose certain strategies, and fostering reflection (Bathgate et al., 2012). Discussing practice strategies with other music students encourages the use of metacognitive strategies (Nielsen, 2004). Music educators may wish to ensure that student musicians have acquired a solid knowledge base, as that is the foundation for being able to implement metacognitive strategies fully and effectively

(Hallam, 2001b). Metacognitive topics that music educators could discuss with their students include how to: evaluate individual strengths/weaknesses, evaluate task complexity, choose practice tactics, choose objectives, self-evaluate, memorize effectively, develop musicianship, increase motivation, manage time wisely, improve focus, and deal with performance issues (Hallam, 2001b).

Motivational Beliefs Impacting Self-regulation and Practice

Several motivational theories prevalent in educational psychology are relevant to students' use of practice strategies and self-regulation, including theories on intrinsic/extrinsic motivation, self-efficacy, causal attributions, goal orientation, and implicit intelligence beliefs. Zimmerman (1998) posited that motivational beliefs have a strong impact on students' self-regulation. Researchers have investigated patterns and characteristics of music students' motivation to practice. Strong correlations exist between task orientation, motivation, self-esteem, and internal attributions for student instrumentalists (Schmidt, 2005). Musical motivation is impacted by individual characteristics, the environment, self-concept, and goals (Hallam, 2002). Primary students with high levels of motivation after twenty months of playing demonstrated self-evaluative and meticulous practice behaviors, and used higher-order thinking skills while practicing (Pitts et al., 2000b). These highly motivated students held adaptive beliefs about the nature of learning and the value of music (Pitts et al., 2000b).

Students who begin music instruction with unrealistic expectations about how much they will practice tend to drop out of music (McPherson & Davidson, 2002). Piano students who practiced a variety of material tended to express greater intrinsic motivation and demonstrate greater cognitive engagement with the music (McPherson & McCormick, 1999). Students who are more impulsive may be at greater risk of ceasing music instruction; music educators may

wish to try to find additional means of motivating these students (Miksza, 2009). The practice time, practice efficiency, and ratio of formal to informal practice of junior high instrumental students were significantly correlated with students' concentration, intrinsic goal motivation, intrinsic challenge motivation, metacognition-reflective strategies, and commitment to improvement (Miksza, 2006b).

Beliefs about the nature of music learning impact how students practice; St. George et al., (2012) divided beliefs about music learning into complex and simple. Students with complex learning beliefs view music performance as requiring many different skills, a sequential and effortful learning task, and as demanding a knowledge of how to learn; students with simple learning beliefs view music performance as being most enjoyable when tasks are easy and knowing how to perform as being an uncomplicated process of remembering and using information (St. George et al., 2012). Musicians must be able to find a balance of formal and informal practicing, motivating themselves to practice more as well as more effectively (McPherson & McCormick, 1999). Students who do more informal musical practicing (playing by ear, improvising), as well as work on repertoire and technical exercises, tend to be more cognitively engaged while practicing, and to be more intrinsically motivated (McPherson & McCormick, 1999).

While pleasure in music making can be very motivating, classical musicians report less pleasure in practicing than musicians in less formal traditions (Bézenac & Swindells, 2009). Pleasure during practice may be impacted by expectations for performance, specific practice techniques, motivations for engaging in musical practice, and musicians' experience of making music (Bézenac & Swindells, 2009). Students studying classical music may be motivated more by a desire to please teachers or parents than by love of the instrument (Bézenac & Swindells,

2009). The motivation a musician feels for pursuing musical skills may be influenced by the degree of self-determination felt (Bézenac & Swindells, 2009). It is possible for music students to internalize the judgments of their parents and teachers in such a way that they may appear to be acting out of intrinsic motivation but are actually extrinsically motivated (Bézenac & Swindells, 2009). Motivation and willingness to spend time on deliberate practice are stable traits that may impact the acquisition of musical skills more than innate giftedness (Ericsson & Charness, 1994).

Many external factors impact music students' motivation, such as parental support (Bézenac & Swindells, 2009; Corenblum & Marshall, 1998; Creech & Hallam, 2011; Ericsson & Charness, 1994; Hallam, 2002; Lehmann, 1997; Lehmann & Gruber, 2006; McPherson & Davidson, 2002; Pitts et al., 2000b), the goal of a musical task (Hatano & Inagaki), environmental characteristics (Austin, 1998; Austin & Berg, 2006; Hallam, 2002; McPherson & Davidson, 2002; Pitts et al., 2000a), music instructor characteristics (Corenblum & Marshall, 1998; Creech & Hallam, 2011; Pitts, 2009; Pitts, Davidson, & McPherson, 2000b), and peers (Corenblum & Marshall, 1998; Hallam, 2002). Classical musicians are more likely to choose an instrument to please their parents than non-traditional musicians (Bézenac & Swindells, 2009). McPherson and Davidson (2002) found that mothers could accurately predict how much support they would have to provide to their children in order to facilitate good practice habits. Environmental factors may include institutional expectations, for example, such as the weight given to academics or athletics in comparison to artistic endeavors like music (Hallam, 2002). Performing on an instrument is a physical activity; students who are correctly matched to instruments that they are more likely to be successful playing may be more motivated to persist in making music (Hallam, 2002). A lifelong dedication to music may depend on an individual's

having had intense emotional reactions to music early in life (Hallam, 2002). Music educators should be aware of how their actions communicate expectations to students; recommending one student for an honor ensemble communicates confidence in that student's ability, but may leave other students feeling unrecognized (Pitts, 2009). Schmidt (2005) found that gender and instrument group did not have a significant impact on student motivation.

Intrinsic motivation. Intrinsic motivation is crucial to sustained participation in an activity over time (Schatt, 2005). Intrinsic motivation is defined as the desire to engage with some task for its own sake (Schunk et al., 2002). External rewards or punishments are not needed to encourage students to participate in activities for which they have intrinsic motivation. Intrinsic motivation leads to improved performance, creativity, and persistence (Ryan & Deci, 2000). Schatt (2011) found that high school instrumentalists with higher intrinsic motivation were more likely to spend more time practicing. Students demonstrate intrinsic motivation when they prefer to be challenged, want to make discoveries rather than make a good grade, try to achieve without the help of the teacher, make decisions for themselves rather than depending on the teacher, and use their own standards for success rather than using outside standards (Schunk et al., 2002). Increasing students' intrinsic motivation may have many musical benefits, impacting practice time (Schmidt, 2005), use of cognitive strategies (Denis & Jouvelot), student effort (Schmidt, 2005), attention and information selection (Denis & Jouvelot, 2005), and self-efficacy, anxiety reduction, increases in learning achievement, and feelings of competence (Schunk et al., 2002). Students are more likely to listen to teachers, rehearse and organize information, and apply what they have learned if they are intrinsically motivated (Schunk et al., 2002). Continuing engagement with an activity has been linked to intrinsic motivation, which

indicates that increasing students' intrinsic motivation may foster lifelong musicianship (Denis & Jouvelot, 2005).

Researchers have investigated influences on intrinsic motivation and means of increasing students' intrinsic motivation. Students' personalities may have an impact on whether they are more motivated intrinsically or extrinsically (Hallam, 2002). Individual characteristics may impact intrinsic motivation in music students: sex, age, attribution orientation, goal setting, and students' interest and achievement level when starting a task (Austin, 1988). Intrinsic motivation does require environmental support, in spite of being an innate human trait (Ryan & Deci, 2000). Teachers can alter the environmental characteristics that impact intrinsic motivation, such as feedback type, teacher orientation, standards, and task difficulty (Austin, 1988). Fostering effort attributions, mastery goal orientations, and growth mindsets toward musical skills should help maintain students' intrinsic motivation for music making (Austin, 1988; Hallam, 2002; Schmidt, 2005; Schunk et al., 2002). Students' intrinsic motivation for school tasks decreases as they move from elementary to high school (Schunk et al., 2002). Students may exhibit more intrinsic motivation for practicing music they have chosen themselves, rather than music chosen by the teacher (Renwick & McPherson, 2002). In a case study conducted by Renwick and McPherson (2002), a young music student spent more time on self-selected music and used a greater number of practice strategies than on music assigned by the teacher.

Extrinsic motivation. While intrinsic motivation is most associated with positive learning outcomes, extrinsic motivation has a role to play as well. There are many musical tasks that are unrewarding, but which must be accomplished in order to reach a goal. Extrinsic motivation is defined as the desire to perform some task for the sake of external rewards or punishments (Schunk et al., 2002). Students' motivation can be a mix of intrinsic and extrinsic

motivation, each in varying degrees; for example, a student can enjoy playing music for its own sake and also want to make first chair (Schunk et al. 2002). Extrinsic motivators are widely utilized in school music programs, although music educators may not perceive them as such. Grades are frequently given in music ensembles, and function as extrinsic motivation (Smeltz, 2012). Competitions can be a source of extrinsic motivation for music students and can be found at all levels of school music, from elementary and junior high to high school and college programs (Austin, 1988; Bézenac & Swindells, 2009). While competition can have a positive impact on student motivation, if students "lose" frequently, motivation to participate in musical activities may decrease (Austin, 1988). Correlations between ratings and student self-esteem have been found – if students receive low ratings, their self-esteem will be lower (Austin, 1988). Verbal praise can also function as an extrinsic motivator, depending on whether it is informational or controlling (Bézenac & Swindells, 2009; Hallam, 2002). Performances may be extrinsic motivators for practicing, even though the act of performing is intrinsically motivating for most musicians (Hallam, 2002). Extrinsic motivation is most effective when it is integrated into students' personalities.

Integrated extrinsic motivation can have positive outcomes (Ryan & Deci, 2000; Schunk et al., 2002). Students may internalize and integrate their parents' or teachers' musical expectations, such that the students are motivated to participate in musical activities that are not enjoyable. Students' sense of autonomy plays a role in integrating extrinsic motivation, so they must believe that the task is useful and aligned with their personal goals (Ryan & Deci, 2000). Students may be extrinsically motivated to practice in order to achieve a musical goal, but they would still be exercising autonomy as long as those students are making decisions for themselves rather than being forced to or rewarded for behaving a certain way by an outside authority figure

(Ryan & Deci, 2000). Students' sense of autonomy may be impacted by the nature of classical training, with the aim of making musicians more or less interchangeable (Bézenac & Swindells, 2009). Music teachers may want to make room for students' interests and unique abilities (Bézenac & Swindells, 2009). A student who understands that practicing scales will lead to better performance of a favorite ensemble piece will be more likely to integrate motivation to practice scales. Relatedness impacts the integration of extrinsic motivation; for example, if students respect and want to feel close to music teachers who emphasize the importance of playing scales, students are more likely to integrate that belief. Competence also impacts the integration process, because students are more likely to integrate motivation for behaviors that they can perform well (Ryan & Deci, 2000). The music teacher encouraging students to play scales should ensure that students have many opportunities to be successful at that activity.

Self-efficacy. Self-efficacy is comprised of the judgments made by individuals about their ability to perform specific tasks (Bandura, 1982; McPherson & McCormick, 2006; Ritchie & Willamon, 2011). Like self-regulation, self-efficacy beliefs concern tasks rather than general abilities, and are therefore domain-specific (McPherson & McCormick, 2006; Ritchie & Willamon, 2011). For example, students may have high academic efficacy and low music efficacy, or high music efficacy and low athletic efficacy. Positive self-efficacy for a task leads to an increased willingness to attempt that task, tying self-efficacy to motivation; for example, students with higher musical efficacy are more likely to be motivated to participate in musical activities (Bandura, 1982; Hallam, 2002). As perceived self-efficacy for a task positively increases, so does performance of that task (Bandura, 1982). Students' motivation to self-regulate has been strongly correlated with their self-efficacy for domain-specific tasks (Picone, 2012; Zimmerman, 1998).

Self-efficacy significantly predicted performance achievement in instrumentalists participating in graded examinations (McCormick & McPherson, 2003). In a subsequent study, McPherson and McCormick (2006) found that self-efficacy was the strongest predictor of student musicians' performance achievement amongst factors of self-efficacy, cognitive strategy use, practice regulation, practice time, grade level, formal practice, and informal practice. Middle and high school music students' self-efficacy scores positively correlated with performance ratings; better performers more accurately rated their efficacy, while less able performers tended to overestimate musical efficacy (Hewitt, 2015). Self-evaluation skills may impact music students' self-efficacy (Hewitt, 2015). Primary and secondary music students' musical self-efficacy significantly predicted their desire to stay involved with music, as did musical self-esteem, enjoyment of performing, and parental involvement (Hallam, 2004).

College musicians' self-efficacy was significantly related to their willingness to use cognitive and metacognitive strategies while learning music (Nielsen, 2004). Male university music students rated their self-efficacy for practicing significantly higher than female university music students, although degree program impacted that effect (Nielsen, 2004). Fifth and sixth graders who demonstrated high self-efficacy for learning music theory used more cognitive strategies to deal with challenges in both convergent and divergent music theory tasks (Fritz & Peklaj, 2011). Conversely, those students who believed auditory music theory tasks to be difficult were less likely to use metacognitive strategies to accomplish assigned music theory tasks (Fritz & Peklaj, 2011). However, McCormick and McPherson (2003) found a negative relationship between the self-efficacy and cognitive strategy use of elementary and secondary instrumental students.

Mastery experiences are the strongest contributor to developing students' self-efficacy (Bandura, 1977). This does not mean that music educators should only give students easy materials, but that the goals that teachers and students work together to set should be small and incremental. Setting appropriate goals is crucial to fostering student motivation and musical efficacy. One of the reasons that unrealistic expectations predict students' dropping out of music programs is that, when students do not meet their own too-high standards, they experience it as a failure and their musical efficacy is lowered. Parental and music teacher relationships can have an impact on students' musical self-efficacy (Creech & Hallam, 2011). In the performance and church music programs, male students had higher self-efficacy for practicing, while in the music education program, female students had higher self-efficacy for practicing (Nielsen, 2004). Self-efficacy can be impacted by improved performance; music instruction contributed to students' musical self-efficacy (Ritchie & Williamon, 2011). Conductors' use of more expressive gestures had a positive impact on musicians' collective efficacy, self-efficacy, attributions, and performance achievement (Matthews, 2007). Results of studies examining the impact of metacognitive and self-regulation instruction on students' musical self-efficacy have been contradictory; Bathgate et al. (2012) found that metacognitive training did not significantly increase music students' self-efficacy scores, while Mieder and Bugos (2017) found that the implementation of a self-regulated learning practice strategies curriculum did significantly increase music students' self-efficacy scores. Music students with higher self-efficacy demonstrate persistence in the face of difficult musical tasks, which may then lead to increased use of practice strategies to work through those tasks. Higher self-efficacy is associated with higher self-regulatory abilities, which should enable music students to choose more effective practice strategies.

Causal attributions for musical success or failure. Causal attributions are beliefs held by individuals about the reasons for success or failure in specific situation (Weiner, 1985). Weiner (1985) proposed a theoretical framework for causal attributions involving three characteristics: locus, stability, and controllability. The reasons for success or failure can be internal or external, stable or unstable, and controllable or uncontrollable. A key point of the theory is that the characteristics of students' attributions impact emotions about the success or failure and thereby influence students' motivation to achieve (Weiner, 1985). Music students' causal attributions for musical success or failure affect practice motivation as well as method. For example, students who attribute their failure at a performance or competition to luck will likely not be motivated to practice more for next time. A student who believes the failure was due to lack of effort likely will be motivated to practice more for the next concert or competition. Causal attributions commonly researched in music include luck, ability, effort, and task difficulty; students may also hold attributional beliefs concerning persistence, strategy use, metacognition and family, teacher, and peer influence (Austin & Vispoel, 1998).

Feedback to students positively impacts students' motivation when the feedback highlights that they were successful when they put forth effort and chose appropriate strategies. When students fail, teachers should make sure that students understand why they failed – not because the students are "bad musicians" or "have no talent," but because of malleable, controllable elements. Internal attributions tend to correlate with amount of practice time; fortunately, music students tend to attribute musical success to internal characteristics such as effort and ability rather than to external characteristics such as luck or task difficulty (Schatt, 2011; Schmidt, 2005). Secondary music students' attributional beliefs correlated with their scores on music achievement tests and with their musical self-concept (Austin & Vispoel, 1998).

On the other hand, Legette (1993) found that internal attributions do not necessarily correlate with higher musical achievement. Female students were more likely to make effort attributions while male students were more likely to make ability or external attributions (Schatt, 2011). Legette (1993) found that university students, both music majors and non-music majors, tended to attribute their success or failure in music to perceived effort, affect for music, and musical ability, with the music majors making stronger attributions to these factors than the non-majors.

Elementary and secondary music students tended to attribute musical success or failure to musical ability and effort (Asmus, 1985; Legette, 1998). Asmus (1986a) found that while elementary and secondary music students tended to make internal attributions for success and failure in music, a greater number of success attributions were internal-stable and a greater percentage of failure attributions were external-unstable. The same pattern did not occur when students made attributions for others' success or failure (Asmus, 1985). Students' context and gender may impact their attributions (Asmus, 1985; Asmus, 1986a; Legette, 1998). In Asmus (1986a), older music students tended to make more ability attributions for success while younger music students tended to make effort attributions. University music students tended to attribute success in others to effort, while attributing their own success to task difficulty (Asmus, 1986b). Asmus (1986b) found that university music students' attributions of success in music were closely related to their attributions of success in academics.

University students' perception of success did not have an impact on their causal attributions, but students' causal attributions predicted their perception of success (Asmus, 1986b). Asmus (1986b) found no differences in causal attributions for sex or concentration (vocal/instrumental), but music education and music therapy students tended to make somewhat different attributions for others' musical success or failure. Austin and Vispoel (1998) found that

secondary students did not attribute success and failure to the same causes. High-achievement and low-achievement music students tend to make different attributions in response to both success and failure (Austin & Vispoel, 1998). Music students tend to respond in more positive, constructive ways when making effort and strategy attributions for failure than when making ability attributions for failure (Austin & Vispoel, 1998). It is possible that the effect that rewards have on decreasing intrinsic motivation may be rooted in students' locus of control – rewards may impact students' belief in their responsibility for their learning, instead creating an external locus of control (Ryan & Deci, 2000). External pressure, in the form of threats, orders, deadlines, imposed goals, and harsh evaluations, function in the same way as rewards, decreasing intrinsic motivation by creating an external locus of control (Ryan & Deci, 2000). Music students who make internal attributions for success or failure will be more likely to put effort into musical practice, possibly leading to the increased use of practice strategies and to students trying out different kinds of strategies. Music students who believe that external factors such as luck have the greatest impact on musical achievement will not be motivated to use more or different strategies.

Goal orientation. Researchers have investigated the impact of goal orientation on student achievement and motivation. Students' goal orientation can be either mastery (focus on achieving a valued task) or performance (focus on achieving relative to other individuals) oriented; additionally, students can have an attitude of approach or avoidance to their goals (Jones et al., 2012). For example, music students with mastery approach orientation seek to develop their musical skills for personal satisfaction. Students with performance approach orientation seek to look like better musicians than other students, and students with performance avoidance orientation seek to not look like worse musicians than other students. Mastery-

avoidance goal orientation seems to involve avoiding not achieving one's goals (Jones et al., 2012). Strong correlations exist between task orientation, motivation, self-esteem, and internal attributions for student instrumentalists (Schmidt, 2005).

Goal orientation has a profound effect on student musicians' achievement, as well as the methods they use to practice. Setting personal goals and adopting a mastery goal orientation may increase students' motivation and persistence in practicing (Miksza, 2009). Mastery approach orientation, along with impulsivity and venturesomeness, predicted performance achievement in a study on personality traits and music performance (Miksza, 2009). Matthews (2007) found that conductors' efforts to instill a mastery-orientation in ensemble members had a positive impact on the musicians' self-efficacy and collective efficacy beliefs, although no effect was observed for attributions or performance. However, the treatment took place over the course of one 12- min rehearsal session; developing students' mastery orientations may require more lengthy treatment periods (Matthews, 2007). Mastery goal orientation was associated specifically with the effective practice strategy of skipping to difficult sections in the music (Miksza, 2009). College music students with mastery orientation were more likely to use multiple practice strategies (Smith, 2005).

Goal orientations may be impacted by several influences. After an intervention of guided practice session over an extended length of time, students' goal orientations tended to be mastery-oriented, and specifically oriented to mastering difficult sections of music (Picone, 2012). Motivation is impacted by the goal of the activity; when more pressure is placed on success through external rewards or punishments, individuals are less likely to experiment and play with different ways of accomplishing goals (Hatano & Inagaki, 1986). Age differences in motivation, task orientation, and attributions exist (Schmidt, 2005). Schmidt (2005) found that

elementary student instrumentalists tended to define musical success by mastery and co-operative orientations rather than competitive or ego orientations, measuring achievement through reaching personal goals. It may be that students at that age may be drawn more to the intrinsically motivating and cooperative aspect of musical participation, rather than extrinsic rewards or competition (Schmidt, 2005). It may also be that teachers are unwittingly engaging in behaviors that increase extrinsic motivation at the expense of intrinsic motivation. Performance goals tend to lead to extrinsic motivation, while learning or mastery goals tend to lead to intrinsic motivation (Hallam, 2002). Music educators should make sure that they speak about musical ability as being a result of effort and good practice strategies. Musicians with the mastery approach goal orientation use more strategies and different strategies during practice than music students with performance goal orientations. This may be due to the mastery approach orientation's focus on the learning task rather than appearances. The mastery approach orientation is associated with higher motivation, persistence, and self-efficacy, which lead to increased strategy use. Music students with the performance approach and performance avoid orientations are less willing to try new and difficult tasks or to make mistakes as a result of wanting to look like good musicians or avoid looking like bad musicians. However, difficult tasks require the use of effective strategies in order to overcome errors, so music students who avoid difficult will have fewer opportunities to develop their musical practice skills.

Implicit beliefs for intelligence and musical talent. Dweck and Elliot (1983) and Dweck and Leggett (1988) proposed a model in which students' beliefs about intelligence impact goal orientation. The model states that students with an implicit belief that intelligence is fixed and cannot be changed (also known as an entity intelligence belief) are more likely to have a performance goal orientation (Dweck et al., 1995). Alternatively, students may hold the implicit

belief that intelligence can be changed (also known as growth or incremental intelligence belief); growth intelligence beliefs tend to be correlated with mastery goal orientations (Dweck et al., 1995). Fixed intelligence beliefs tend to motivate students to prefer "looking good" in class (performance goal orientation) and leads to avoidance of challenges whereas a growth intelligence belief motivates students to want to learn more even at the cost of appearances (mastery goal orientation) (Dweck et al., 1995). Interventions designed to move students' implicit intelligence beliefs from entity to growth beliefs have resulted in altering students' goal orientations toward mastery goals, although it may be that changing students' goal orientations can also influence implicit intelligence beliefs (Dweck et al., 1995).

Fixed intelligence beliefs are associated with a variety of maladaptive learning behaviors, such as learned helplessness and the belief that exerting large amounts of effort demonstrates low ability levels (De Castella & Byrne, 2015; Dweck et al., 1995). De Castella and Byrne (2015) also found that students' fixed intelligence beliefs were associated with reports of lower academic performance. Research in musical motivation and achievement has added evidence to this model. Hallam (2002) found that music students with a fixed/entity view of intelligence were more likely to set performance goals, while students with a growth view of intelligence were more likely to set mastery goals. It seems that students may hold implicit beliefs about musical talent as well as general intelligence. Smith (2005) found that music students who held entity beliefs regarding music achievement were more likely to make goals based on comparisons with other students. In other words, students who thought that musical ability was a quality one either did or did not have were motivated to demonstrate that they possessed that ability. These students with fixed musical talent beliefs were especially motivated to avoid situations in which they might fail to demonstrate that they possessed musical ability relative to

other students (Smith, 2005). The students who believed that one could increase musical ability were more likely to make mastery goals, focusing on musical tasks rather than comparisons with other students (Smith, 2005). Implicit beliefs may be domain-specific; a student may believe that athletic ability is fixed, while reading skills are malleable (Jones et al., 2012). Growth beliefs did predict mastery goal orientations and positive effort beliefs in math students, which in turn led to use of positive strategies and higher math grades; there were no statistically significant differences between female and male math students (Jones et al., 2012). Students' interest in math significantly impacted goal orientations, and interest was predicted by students' growth beliefs about math ability (Jones et al., 2012). Music students with growth beliefs about musical intelligence should be more likely to use positive practice strategies as these students will be focused on increasing musical skill through attempting difficult tasks. Performance errors should lead music students with growth beliefs to try different strategies, while students with fixed beliefs will be more likely to avoid difficult musical tasks so as to not look like they lack musical talent.

In Chapter 2, I have described past research on self-regulation, music practice, self-regulated music practice, and motivational beliefs. While researchers have investigated the link between learning strategies and students' self-regulation and motivational beliefs, the connections between observed music practice strategies and students' self-regulation and motivational beliefs has not been thoroughly explored. The purpose of this study is to determine whether there is a relationship between university music students' self-regulation, motivational beliefs, and background characteristics and the number and kinds of practice strategies used during 30 min of practicing.

Chapter 3: Methodology

The research problem is that researchers have yet to determine a clear connection between students' self-regulation and what kinds of music practice strategies university music students use. Researchers also have yet to determine a clear connection between motivational beliefs and students' music practice strategies. Therefore, the purpose of this study was to determine whether there is a relationship between university music students' self-regulation, motivational beliefs, and background characteristics and the number of practice strategies used during 30 min of practicing. The research questions used to guide this study were:

1. After controlling for participants' known background characteristics (age, sex, primary instrument, years of playing, years of private lessons, average hr of practice per week, and training on another instrument), do university music students' self-regulatory abilities, self-perceptions and motivational beliefs (self-efficacy, locus of causal attributions, goal orientation, and implicit talent beliefs) predict the number of practice strategies used during a 30-min practice session?
2. After controlling for participants' known background characteristics (age, sex, primary instrument, years of playing, years of private lessons, average hr of practice per week, and training on another instrument), do university music students' self-regulatory abilities, self-perceptions and motivational beliefs (self-efficacy, locus of causal attributions, goal orientation, and implicit talent beliefs) predict the total kinds of practice strategies used during a 30-min practice session?

Description of Participants

The population under discussion in this study is comprised of undergraduate university music students. The sample was recruited from three universities in the mid-South. One university is a

public institution located in a large metropolitan area with a student body of over 22,000; two universities are located in rural farming communities. Of the two universities located in rural areas, one is a public university with a student body of over 6,700 and the other is a small private religious institution with a student body of over 4,300. The sample was a convenience sample.

At the two public institutions, participants were initially recruited through an email sent out to all music majors describing the study and its procedures. At the private university, the music education coordinator contacted participants and scheduled the recording sessions. I spoke to potential participants at the rural public university's wind ensemble rehearsals. Potential participants at the large public university were also contacted using the music education Facebook page. Participation in the study was coordinated through email. The recruiting process was maintained until I had recruited as many participants as possible before the end of the semester. I had been a graduate assistant at the large urban institution for two years and had taught some of the music education students at that university. At the time of the study, I was the music education coordinator at the rural public institution and had most of the music education students in my classes. I had no affiliation with the rural private institution.

Demographic information was collected from participants including age, sex, major, primary instrument, years playing the primary instrument, years of lessons on the primary instrument, average hr of weekly practice, whether the participant had training on another instrument, and if so, on which instrument. Participants were music majors whose degrees included include: performance (n = 4), music education (n = 32), bachelor of arts in music (n = 2), and music business (n = 2). Only participants whose primary instrument was a wind instrument were recruited. Participants were male (n = 20) and female (n = 20), and attended three different

universities: a large urban public institution (n = 6), a small rural public institution (n = 30), and a small private institution (n = 4).

Participants played woodwind (n = 20) and brass (n = 20) instruments. The specific primary instruments are listed in Table 1. For the purposes of data analysis, the variable of primary instrument was grouped by instrument family. Woodwind instrumentalists were coded as 1, and brass instrumentalists were coded as 2.

Table 1

Participants' Primary Instrument

Instrument	Number of participants
Flute	5
Soprano Clarinet	7
Bass Clarinet	1
Alto Saxophone	5
Oboe	1
Bassoon	1
Trumpet	8
Horn	3
Trombone	4
Bass Trombone	1
Euphonium	2
Tuba	2

Participants were asked if they had training on another instrument, and 15 participants said yes. These participants had training on more than on other instrument (n = 8), piano (n = 1), voice (n = 1), flute (n = 1), soprano clarinet (n = 1), alto saxophone (n = 1), baritone saxophone (n = 1), and euphonium (n = 1).

Descriptive data for participants' age, years playing the primary instrument, years of lessons on the primary instrument, and average weekly hr of practice are listed in Table 2. For the purpose of data analysis, participants' years of playing the primary instrument were grouped, with participants who had played the primary instrument for less than 9 years (n = 19) being coded as 1, and participants who had played the primary instrument for more than 9 years (n = 21) being coded as 2. Participants' years of lessons on the primary instrument were grouped, with those who had had less than 4 years of lessons (n = 21) being coded as 1 and those who had had 4 or more years of lessons (n = 19) coded as 2. Participants' average hr of weekly practice were grouped, with participants who reported practicing less than 10 hr per week (n = 17) being coded as 1, and participants who reported practicing 10 or more hr per week (n = 23) being coded as 2.

Table 2

Descriptive Statistics for Participants' Demographic Information

Source	*M (SD)*	Range
Age	20.03 (1.23)	18 – 23 years
Years playing instrument	8.4 (2.47)	1 – 13 years
Years of lessons	3.25 (1.71)	1 – 7 years
Average hr of practice per week	11.11 (5.97)	4 – 28 hr

IRB approval was secured from the University of Memphis before proceeding with the study (see Appendix B); participants signed an IRB-approved consent form (see Appendix A) before beginning participation in the study. IRB requirements were met to ensure confidentiality of data.

Procedures

The university music students entered a university practice room equipped with a copy of the music, a music dictionary, pencils, a metronome, an H2 Zoom recorder, and a piano. The researcher gave instructions to the students to practice just as they normally would, began video-recording with the iMovie app on a 2010 Macbook Pro computer, and left. Students practiced the music for the duration of 30 min. At the end of the 30 min, the researcher entered the practice room, gave students the questionnaire containing the self-regulation and motivational beliefs scales, and gave instructions for how to complete the questionnaire. The instructions included how to complete a Likert-type scale; the researcher answered any questions participants had about the questionnaire. Students were given as much time as they required to complete the questionnaire. When students were finished with the questionnaire, they gave the completed questionnaire to the researcher; while I did not time participants, most took 5-10 min to finish. I viewed the recordings of the practice sessions on a 2015 HP Pavilion laptop and coded the participants' use of practice strategies using the Practice Strategies Checklist. I watched the videos in a quiet room in my house with a desk using iFrogz earbuds. Every time I saw or heard a practice behavior, I made a checkmark next to that behavior. There is an item on the checklist for the description of other practice behaviors not on the list; if students exhibited a practice behavior not on the list, I wrote down the practice behavior and made a mark next to it. The iMovie app (version 10.1.1) on a 2010 MacBook Pro was used to video-record participants'

practice sessions. The internal microphone of the Mac was used to capture sound. The audio and visual quality of the recordings was of high enough quality to determine the types of practice strategies participants were using during the practice session, and recording directly into the computer allowed for increased security, as well as ease of storage and sharing with the second judge. Participants were permitted to use their own equipment when practicing, because the directions were to practice the music as if preparing for a lesson as usual. I did make some equipment available to students: a metronome/tuner (Snark 2010 Tuner/Metronome), an audio recorder (a Zoom H2 recorder, Z494), a pair of headphones for listening to the recording (Sony earbuds), and a music dictionary (Harnsberger, 1996).

Analysis Plan

Data were analyzed using two multiple regressions, with university music students' self-regulation, motivational beliefs, and background characteristics serving as the predictor variables. The number of total practice strategies and the number of kinds of practice strategies used during 30 min of practice were the outcome variables. The alpha level was $p = .05$. A correlation table was included among the predictors.

Discussion of threats to internal validity. In considering participant characteristics that might prove to be threats to internal validity, I decided to limit participant selection to wind instrumentalists only. Musicians working in different mediums have different strategies to deal with performance difficulties inherent to their concentration area, so limiting participants to wind instrumentalists should control for that threat. Since all participants are university music students who auditioned to be accepted into their university's school of music, all participants should be able to perform proficiently on their primary instruments. One etude from the Watkins-Farnum Performance Scale was chosen to standardize the music that participants were practicing. This

eliminated threats resulting from participants practicing a variety of music chosen individually; however, using one piece of music at a standardized level of difficulty meant that some participants would find it easier to perform than other participants. There seems to be no useful means of controlling for both threats at the same time. Additionally, it may be that individual applied professors place more of an emphasis on practice strategies during lessons than others, or that some professors work with their students to develop adaptive motivational beliefs and self-regulatory behaviors, which may impact results. While a survey of the applied professors was considered, previous research results have indicated that there is a low correlation between what professors think students will be taking away from the lessons and what students in fact remember and use in the way of practice strategies (Hallam, 2001a; Kostka, 2002). Thus, there does not seem to be useful means of controlling for this threat.

Location threat was controlled for by recording participants' practice sessions in the rooms that they normally practice in. While different universities have somewhat different practice rooms, the practice rooms were all built to be mostly sound proof and all contained a piano, a chair, and a stand. Being recorded may have impacted how participants practiced, but, short of deception, there does not seem to be a way to control for that threat; the researcher did leave the practice room during the recording session to make the practice session as much like a normal one as possible. Using a Macbook to record the practice sessions meant that participants could see themselves being recorded. Although the computer was placed out of direct eyeline of the participants, the fact that participants could see themselves being recorded may have impacted practice behaviors. The time constraint – insisting that participants practice the etude for 30 min – may impact how the participants practice as some musicians may have chosen to practice for either more or less time under normal circumstances. 30 min seemed reasonable

given the difficulty level of the music; also, it would be difficult to compare the frequency of practice strategy use in sessions of differing length.

Instrument decay was another concern in coding the practice strategies used during the session. To minimize the effect of personal interpretations of the practice behaviors recorded during the sessions, fifty percent of the sessions were coded by another researcher and inter-judge reliability was run to ensure an adequate level of agreement, as in Mikzsa, 2007. I and the second coder took breaks in between coding the practice sessions to prevent scorer fatigue.

Testing, maturation, and mortality threats were not an issue during this study as all participants only completed one session and one questionnaire, with the exception of one participant who kindly agreed to do another practice session after the original video file did not upload correctly. Participant fatigue may have presented a threat as practice sessions were recorded at different times during the day; participants who recorded practice sessions at night after playing all day may have experienced more fatigue than participants who recorded practice sessions in the morning. Participant attitude threats may impact results because participants volunteered for this study; it may be that the participants who volunteered were more interested in practice strategies, self-regulation, and motivational beliefs and therefore would be more likely to use a variety of practice strategies or to demonstrate high levels of self-regulation or adaptive motivational beliefs. The researcher attempted to reduce the possibility of implementation threat by not mentioning practice strategies when giving instructions to students ("practice as you normally would to prepare this music for your professor") and by having students take the self-regulation and motivational beliefs scales after the recorded practice session.

Content Validity Panel

A content validity panel was recruited to assess the self-regulation and motivational beliefs scales and the practice strategies checklist. Members of the content validity were four experienced music education researchers who have published studies on music students' self-regulation, motivational beliefs, and practice behaviors. Recommendations of the content validity panel will be referenced when discussing the self-regulation and motivational beliefs scales and the practice strategies checklist.

Instruments

Information on students' self-regulation, motivational beliefs, and background characteristics was collected using a questionnaire. The questionnaire is comprised of fifty-six statements with 7-point Likert-type rating scales (see Appendix B). The Likert-type rating scales ranged from 7 to 1 based on the recommendation of members of the content validity panel, with 7 (strongly agree) and 1 (strongly disagree) serving as the anchor points. The mid-point of 4 served as a "neither agree nor disagree" option for participants. Demographic information was collected by asking students to report their age, major, primary instrument, years playing the primary instrument, years of private instruction, average hr of practice per week, and whether the students have training on another instrument. Information on students' use of practice strategies was collected by recording the students practicing the Watkins-Farnum etude 13 for 30 min. The Watkins-Farnum etude 13 was chosen so that all participants would practice an unfamiliar piece that had been standardized to provide equal difficulty to all instruments. The Watkins-Farnum Performance Scale consists of 14 etudes ranged in order of difficulty. The 13th etude was chosen to provide students with enough difficulty to elicit a variety of practices strategies and because students at one of the universities had possibly seen the 14th etude during a previous study

(Summitt & Fisher, 2017; Zdzinski, 1996). Practice strategies were coded using the Practice Strategies checklist. The researcher watched the videos of practice sessions and marked all observed practice strategies.

Self-regulation and motivational beliefs scales. I compiled the self-regulation and motivational beliefs scales from four pre-existing measures to ensure the validity of the instruments. Members of the content validity panel recommended that I use pre-existing measures where possible to ensure validity. Scoring of the self-regulation and motivational beliefs scales was conducted in accordance with the procedures used in the original source measures. After conducting a text analysis through Readable.io (Readable.io, 2016), the reading level of the questionnaire was found to be at the sixth-grade level. Field test participants indicated that the questionnaire made sense, but pointed out one spelling error and a duplicated item. One field test participant pointed out that the implicit beliefs questions seemed to be variations of the same question; the perception is accurate, but the practice is in accordance with other research conducted on implicit beliefs (De Castella & Byrne, 2015).

Self-regulation scale. Nine self-regulation items from Miksza's Self-Regulation and Motivation in Music Practice measure (2006b) were used to measure self-regulation; Miksza's original self-regulation sub-scale had an alpha of .76. I eliminated one item ("If I can't play a piece correctly I stop to think about how it should sound") to try to keep each of the scales at similar lengths, based on the recommendation members of the content validity panel. Participants' scores on the self-regulation items for this study were summed to give a self-regulation score with a possible range of 9 to 63 – higher scores indicated greater self-regulation in musical activities (Miksza, 2006b, 2011).

Self-efficacy scale. Nine self-efficacy items from Miksza's 2011 study were used to measure self-efficacy. Cronbach's alpha reliability coefficient for Miksza's self-efficacy subscale was .83 (Miksza, 2011). Participants' scores on the self-efficacy items were summed to give a self-efficacy score with a possible range of 9 to 63. Higher scores indicated participants' greater degree of confidence in their ability to accomplish musical tasks (Miksza, 2006b, 2011).

Locus of causal attribution scale. Eight causal attribution items from Miksza's Self-Regulation and Motivation in Music Practice measure (2006b) were used; one causal attribution item, "When my practice is successful, it is because I used effective practice strategies," was added in order to measure students' beliefs about strategy use and to bring up the number of statements to equal the self-regulation and self-efficacy scales. Cronbach's alpha for Miksza's original causal attribution sub-scale was .58. The causal attribution items for this study measured both locus of control (internal vs. external) and controllability (controllable causes vs. uncontrollable causes). Therefore, causal attribution items were summed twice – once to determine locus of control and once to determine controllability; the possible range of causal attribution scores was 9 to 63 (Miksza, 2006b). Higher scores for locus of control indicate students' belief that musical success or failure is caused by internal factors such as effort or talent. Higher scores for controllability indicate that participants believe musical success or failure is caused by factors that they can control.

Goal orientation scales. Goal orientation items from the Patterns of Adaptive Learning scales were used: five mastery approach (alpha = .85), five performance approach (alpha = .89), five mastery avoid (alpha = .78), and six performance avoid (alpha = .75) (Midgley et al., 2000). These items were altered to reflect musical practice rather than the classroom behaviors measured in the Patterns of Adaptive Learning Scales; for example, "It's important to me that I

learn a lot of new concepts this year" was changed to read "It's important to me that I learn a lot of new musical concepts this year." The mastery avoid statements had been drawn from the "Avoiding Novelty" sub-scale of the PALS. After consulting with members of the dissertation committee, I decided to remove participants' scores for the mastery avoid goal orientation since the PALS sub-scale may not strictly measure that construct. Scores for goal orientation were divided between the mastery approach, performance approach, and performance avoid items and averaged for each of the goal orientations (Midgley et al., 2000). The possible range for scores on each of the goal orientations were from 1-7. Higher scores indicate participants' higher orientation for a particular goal.

Implicit beliefs scale. Eight implicit intelligence items from De Castella and Byrne's Implicit Self-Theory Scale (2015) were used; these items were altered only by substituting "musical talent" and "musical ability" for the word "intelligence". Cronbach's alpha reliability coefficient for the original scale was .90. Implicit beliefs items were averaged after reverse scoring the fixed belief statements; scores had a possible range of 1 to 7 (De Castella & Byrne, 2015). Higher scores indicated a belief that musical talent can be changed (growth belief), while lower scores indicated a belief that musical talent is fixed. Participants' self-regulation, self-efficacy, causal attributions, goal orientation, and implicit beliefs scores served as the predictor variables in the multiple regression.

Pilot study internal consistency. Internal consistency for the pilot study is reported in Table 3. Pilot study participants (*N = 4*) were music students at a rural public university and included sophomores (*n = 3*) and one freshman; trumpet (*n = 1*), trombone (*n = 1*), and horn (*n = 2*) players; male (*n = 1*) and female (*n = 3*) students. When internal consistency for the pilot

study data was checked, the alphas for the scales varied widely (.52 to -.98), possibly due to low sample size.

Table 3

Pilot Study Internal Consistency for Self-Regulation and Motivational Beliefs Scales

Sub-Scale		Cronbach's alpha	*M (SD)*
Self-Regulation		.52	54.00 (4.08)
Self-Efficacy		.95	45.50 (13.03)
Causal Attributions		-.59	41.00 (2.71)
Goal Orientation		.76	93.75 (11.64)
	Mastery approach	.63	33.25 (2.36)
	Performance approach	.73	20.75 (6.08)
	Mastery avoid	.62	10.75 (4.03)
	Performance avoid	.79	29.00 (5.83)
Implicit Beliefs		-.98	31.75 (3.30)
	Fixed	.76	8.75 (5.85)
	Growth	.83	23.00 (3.83)

Main study internal consistency. Internal consistency for the main study scores for the self-regulation and motivational beliefs scales is reported in Table 4. An attempt was made to raise the alpha for the self-regulation by eliminating one or more questions; however, the highest alpha that could be achieved was .65 after dropping a total of four questions. The statements were "When I learn a piece, I spend most of my time practicing the most difficult sections," "I usually have a plan of what I need to practice most before I begin my practice session," "I listen

to my own playing while I practice to make sure I am not reinforcing bad habits," and "I keep a written record of my practice goals." These statements assess participants' self-perceptions of various self-regulatory behaviors, and I decided that the data from these statements was more important than increasing the alpha. While Miksza's (2006b) self-regulation scale had an alpha of .76, I did eliminate one of the original statements to attempt to keep the different scales at similar lengths. Additionally, Mikzsa's study had a sample of 175 7th- and 8th-grade music students in contrast to my sample of 40 university music students. For the causal attribution scale, it was found that removing the first causal attribution question, "The effectiveness of my practicing is due to my own natural musical ability," increased Cronbach's alpha for that scale from .66 to .80. Therefore, participants' scores on the locus of causal attribution scale were re-calculated and used for the final analysis; the range of possible scores for causal attributions was then 8 - 56. All assumptions were checked using the adjusted data set.

Table 4

Main Study Internal Consistency for the Self-regulation and Motivational Beliefs Scales

Scale	Cronbach's alpha	*M (SD)*
Self-Regulation	.61	50.73 (6.61)
Self-Efficacy	.85	50.40 (8.64)
Causal Attributions	.80	44.55 (7.40)
Goal Orientation		
Mastery approach	.89	6.47 (.71)
Performance approach	.93	4.58 (1.67)
Mastery avoid	.87	2.93 (1.48)
Performance avoid	.82	4.71 (1.26)

Table 4 (Continued)

Main Study Internal Consistency for the Self-regulation and Motivational Beliefs Scales

Scale	Cronbach's alpha	*M (SD)*
Implicit Beliefs	.86	6.29 (.79)

Practice strategies checklist. The practice strategies checklist (see Appendix D) was compiled from practice strategies used in previous studies: Barry (2007); Miksza (2007); Miksza et al., (2012); Rohwer (2002); Rohwer and Polk (2006). Most of the strategies listed in the original sources were used, except for strategies that were too general or too specific to be useful, that did not match the methodology of the current study, or that were not observable (see Appendices E and F). The final checklist included a total of 34 behaviors with space for additional observed behaviors to be written in. The content validity panel indicated that the list of behaviors was both concise and comprehensive – members of the panel said that there were no practice behaviors that needed to be added or taken away. The purpose of the checklist was to help the research determine not only which kinds of strategies participants used, but also how many times each specific strategy was used. The number of times a participant was observed using each strategy was summed to get the total number of strategies, which was the outcome variable for research question 1. The number of discrete kinds of strategies was the outcome variable for research question 2.

Pilot study interjudge reliability. The researcher and another judge coded four practice sessions for the pilot study. The second judge is an experienced music educator who is a Ph.D. Music Education candidate at a large urban university. For the purposes of data analysis, only the primary researcher's scores were used, as in Miksza (2007). To assess interjudge reliability,

Pearson Product-Moment correlations were calculated for the total numbers of strategies and total kinds of strategies coded by the researcher and the second judge. The correlation for the total number of strategies was .69 and the correlation for the total kinds of strategies was -.19. The pilot study sample (n = 4) was very low, possibly impacting interjudge reliability. For the pilot study, participants' mean total number of strategies was 113 (range = 92 - 130), and participants' mean total kinds of strategies was 16.8 (range = 16 – 19).

Main study interjudge reliability. Main study interjudge reliability was calculated by entering two judges' scores for 20 practice sheets. The second judge had coded practice strategies for the pilot study. For the main study, the researcher and the second judge coded several practice sessions together to ensure agreement on how observed behaviors would be coded. To assess interjudge reliability for the main study, Pearson Product-Moment correlations were calculated for the total numbers of strategies and total kinds of strategies coded by the researcher and the second judge. The correlation for the total number of strategies was .80 and the correlation for the total kinds of strategies was .67.

In Chapter 3, I have reported in detail about the participants, procedures, analysis plan, and instrumentation for the current study.

Chapter 4: Results

Descriptive statistics were calculated for participants' scores on the self-regulation and motivational beliefs scales and are reported in Table 5. In examining the descriptive data for the self-regulation and motivational beliefs scales, it appears that participants tended to score high. The means and ranges for the self-regulation and self-efficacy scales indicated that participants considered themselves able to self-regulate their musical practice and to practice effectively. The mean and range for the locus of causal attributions indicated that participants generally assigned internal causal attributions (ability, effort, strategy use) to success or failure in music. Participants' goal orientation scores indicated strong agreement with the mastery approach statements and somewhat weaker agreement with the performance approach and performance avoid statements. The mean and range for implicit beliefs scores indicated that participants generally held growth beliefs about musical talent and ability.

Table 5

Descriptive Statistics for Self-regulation and Motivational Beliefs Scales

Scale	Possible Scores	Range	*M* (*SD*)	Skewness/ Kurtosis
Self-regulation	9-63	33-63	50.9 (6.81)	-.39/.17
Self-efficacy	9-63	30-63	50.45 (8.62)	-.92/.20
Locus of Causal Attributions	8-56	27-53	44.55 (7.4)	-.67/-.47
Mastery Approach Goal Orientation	1-7	4.8-7	6.47 (.71)	-1.14/-.01
Performance Approach Goal Orientation	1-7	1-7	4.58 (1.67)	-.43/-.74
Performance Avoid Goal Orientation	1-7	1.5-7	4.71 (1.26)	-.45/.11
Implicit Beliefs	1-7	4-7	6.29 (.79)	-.98/.15

Descriptive statistics for the practice strategies used by participants were calculated and are listed in Table 6. Participants' total number of observed practice strategies ranged from 56 to 297 with a mean of 151.53 (*SD* = 54.44). The total kinds of practice strategies used by participants ranged from 12 to 24 with a mean of 17.23 (*SD* = 3.28). None of the participants used the strategies "write down practice goals/set goals" or "organize environment." All participants used the strategies "repeat notes," "repeat less than four measures," and "repeat section." The strategy with the highest mean number of observations was "repeat notes" (*M* = 39.5).

Table 6

Descriptive Statistics for Participants' Observed Practice Strategies

Practice strategy	Frequency	Range	*M* (*SD*)
Write down practice goals/ Set goals	0	0	0 (0)
Organize environment	0	0	0 (0)
Look through music before starting	37	0 – 2	.98 (.36)
Play scale of passage	12	0 – 3	.45 (.78)
Use of tuner	11	0 – 8	.85 (1.85)
Use of piano	9	0 – 6	.63 (1.55)
Mark music	38	0 - 50	12.35 (9.73)
Recorded own performance/ Self-listening	6	0 – 3	.25 (.71)
Look up terms in music dictionary	2	0 – 4	.13 (.65)
Use of metronome	38	0 - 24	7.75 (5.47)
Repeat notes	40	4 - 149	39.50 (28.48)

Table 6 (Continued)

Descriptive Statistics for Participants' Observed Practice Strategies

Practice strategy	Frequency	Range	*M* (*SD*)
Repeat less than four measures	40	5 - 124	33.68 (22.32)
Repeat more than four measures	37	0 - 18	5.13 (4.21)
Repeat section	40	2 - 29	9.15 (6.29)
Play section certain number of times correctly before moving on	16	0 – 8	1.38 (2.16)
Whole-part-whole	10	0 – 9	.63 (1.71)
Chaining	19	0 – 7	1.60 (2.33)
Repeat whole etude	35	0 - 17	5.65 (4.41)
Alternate slow practice with at-tempo practice	6	0 – 2	.18 (.45)
Bop/speak rhythm	17	0 - 15	1.38 (2.92)
Play rhythm on single pitch	3	0 - 12	.48 (2.10)
Body movements (tapping foot, etc.)	35	0 - 48	6.70 (9.63)
Wind patterns	16	0 - 18	1.85 (3.96)
Counting the beat	10	0 – 4	.45 (.93)
Clap rhythm	5	0 – 2	.18 (.50)
Varying pitch	6	0 – 2	.20 (.52)
Varying rhythm	18	0 - 11	1.23 (2.17)
Varying tempo	39	0 - 26	5.30 (5.56)
Varying other musical element	13	0 – 5	.68 (1.29)
Singing/whistling	24	0 - 23	3.90 (5.90)

Table 6 (Continued)

Descriptive Statistics for Participants' Observed Practice Strategies

Practice strategy	Frequency	Range	*M* (*SD*)
Silent fingering	23	0 - 15	2.08 (3.19)
Work on most difficult sections first/skipping	3	0 – 2	.13 (.46)
Pinpointing difficult sections	20	0 – 8	1.05 (1.52)
End session by playing completely through etude	6	0 – 1	.15 (.36)
Other strategies	34	0 - 22	5.43 (5.27)

The correlation matrix for the predictor variables is listed in Table 7. None of the variables were highly correlated, although participants' performance approach and performance avoid scores were moderately correlated (.72) and participants' locus of causal attributions and implicit beliefs scores were moderately correlated (.65).

Table 7

Correlation Matrix of Predictor Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Age														
2. Sex	.20													
3. Primary Instrument	.11	-.08												
4. Years Playing	.44	.18	.03											
5. Years Lessons	.48	.03	-.03	.03										
6. Weekly Practice	.15	-.19	-.02	-.19	.40									
7. Other Instrument	.02	.60	.24	.07	.03	-.12								
8. Self-Regulation	.19	.01	-.40	.01	.23	.28	-.06							
9. Self-efficacy	.13	-.31	-.15	-.11	.06	.19	-.31	.39						
10. Causal Attributions	-.06	.12	-.23	-.13	.02	.02	.02	.26	.36					
11. Mastery Approach	-.07	.00	-.02	.11	-.00	.15	-.06	.22	.47	.50				
12. Performance Approach	.40	-.04	.12	.31	.34	.26	-.04	.05	.27	-.26	.10			
13. Performance Avoid	.19	-.21	.07	.24	.16	.06	-.25	-.04	.26	-.16	.08	.72		
14. Implicit Beliefs	.01	-.04	-.17	-.06	-.23	.07	-.05	.17	.37	.65	.45	-.20	-.16	

Research Question 1

In order to answer research question 1: "After controlling for participants' known background characteristics (age, sex, primary instrument, years of playing, years of private lessons, average hr of practice per week, and training on another instrument), do university music students' self-regulatory abilities, self-perceptions and motivational beliefs (self-efficacy, locus of causal attributions, goal orientation, and implicit talent beliefs) predict the number of practice strategies used during a 30-min practice session?", a multiple regression analysis was conducted. The predictor variables included participants' scores for self-regulation, self-efficacy, locus of causal attributions, mastery approach goal orientation, performance approach goal orientation, performance avoid goal orientation, and implicit musical talent beliefs as well as demographic data (age, sex, primary instrument, years playing the primary instrument, years of lessons for the primary instrument, estimated hr of practice per week, and whether participants had training on another instrument), with the outcome variable being total number of observed practice strategies used by participants during a 30-min practice session. Before running the analysis, assumptions were checked. No data were missing.

The data for the continuous variables were converted to standardized z-scores and checked for univariate outliers. The variable of implicit beliefs scores had an outlier close to ±3, so that score was eliminated. Cook's distance was calculated to check for multivariate outliers; no cases had a Cook's distance greater than 1 and therefore no multivariate outliers were present. The histograms of the residuals were produced and examined to check the normality of the residuals; the residuals appear to fit the normal distribution curve. Normality of the continuous variables were checked to see that skewness and kurtosis statistics were lower than ±1. The

variable of mastery approach orientation had a skewness of 1.14, which was deemed acceptable; all other continuous variables were lower than ±1. Scatter plots were calculated for the relationship between the predictor and the criterion variable of total number of practice strategies to check for curvilinear relationships; none of the scatterplots indicated a curvilinear relationship between the predictors and criterion variable. To check homoscedascity, the standardized predicted values were plotted against the standardized residuals for both regressions and the residuals appeared to be evenly distributed around the center line. To check for multicollinearity, tolerance and VIF diagnostics were run. The VIF statistics for locus of causal attribution scores and controllability of causal attribution scores were greater than 5, indicating a problem with multicollinearity. Only one question out of the nine causal attribution questions was used to differentiate between locus and controllability, so it seems reasonable to expect that there would be a high degree of correlation between those two scores. When the scores for controllability of causal attribution were dropped from the regression, all VIF statistics were less than 4, indicating that there were no longer any multicollinearity problems.

Regression analysis for research question 1. The correlation coefficient resulting from the multiple regression analysis for total number of strategies showed that there was a relatively strong correlation (R = .75, p = .05) between the predictor variables and total number of strategies used. The coefficient of determination (R^2 = .56, adjusted R^2 = .30) indicated that 56% of the variance in the total number of practice strategies used by participants was explained by the predictor variables. Beta weights and significance for each predictor variable are listed in Table 8. Of the predictor variables, the following variables significantly contributed to the model: sex (b = 56.58, p = .01), self-regulation (b = 3.15, p = .04), locus of causal attributions (b = -4.17, p = .03), and performance approach (b = 18.69, p = .04).

Table 8

Contributions of Predictor Variables to Regression Equation 1

Source	*B*	*SE/B*	β	*T*	*P*
Age	-.50	9.21	-.01	-.05	.96
Sex	56.58	21.02	.52	2.69	.01
Instrument Family	10.85	18.69	.10	.58	.57
Years Playing	-22.56	20.36	-.21	-1.11	.28
Years Lessons	-29.27	21.52	-.27	-1.36	.19
Weekly Practice	-8.77	19.11	-.08	-.46	.65
Other Instrument Training	-32.72	21.35	-.29	-1.53	.14
Self-regulation	3.15	1.45	.38	2.18	.04
Self-efficacy	-.39	1.44	-.06	-.27	.79
Locus of Causal Attributions	-4.17	1.76	-.52	-2.37	.03
Mastery Approach	-2.12	15.8	-.03	-.13	.89
Performance Approach	18.69	8.35	.57	2.24	.04
Performance Avoid	-12.97	9.51	-.30	-1.36	.19
Implicit Beliefs	25.05	16.64	.32	1.51	.15

Research Question 2

In order to answer research question 2: "After controlling for participants' known background characteristics (age, sex, primary instrument, years of playing, years of private lessons, average hr of practice per week, and training on another instrument), do university

music students' self-regulatory abilities, self-perceptions and motivational beliefs (self-efficacy, locus of causal attributions, goal orientation, and implicit talent beliefs) predict the total kinds of practice strategies used during a 30-min practice session?", a multiple regression analysis was conducted. The predictor variables included participants' scores for self-regulation, self-efficacy, locus of causal attributions, mastery approach goal orientation, performance approach goal orientation, performance avoid goal orientation, and implicit musical talent beliefs as well as demographic data (age, sex, primary instrument, years playing the primary instrument, years of lessons for the primary instrument, estimated hr of practice per week, and whether participants had training on another instrument), with the outcome variable being total kinds of observed practice strategies used by participants during a 30-min practice session. Before running the analysis, assumptions were checked. No data were missing.

The data had already been checked for outliers and normality when conducting the analysis for research question 1. Scatter plots were calculated for the relationship between the predictor and the criterion variable of total kinds of strategies to check for curvilinear relationships; none of the scatterplots indicated a curvilinear relationship between the predictors and criterion variable. To check homoscedascity, the standardized predicted values were plotted against the standardized residuals for both regressions and the residuals appeared to be evenly distributed around the center line. To check for multicollinearity, tolerance and VIF diagnostics were run. The VIF statistics for locus of causal attribution scores and controllability of causal attribution scores were greater than 5, indicating a problem with multicollinearity. Only one question out of the nine causal attribution questions was used to differentiate between locus and controllability, so it seems reasonable to expect that there would be a high degree of correlation between those two scores. When the scores for controllability of causal attribution were dropped

from the regression, all VIF statistics were less than 4, indicating that there were no longer any multicollinearity problems.

Regression analysis for research question 2. The correlation coefficient resulting from the multiple regression analysis for kinds of strategies used by participants showed that there was a relatively strong correlation (R = .73, p = .07) between the predictor variables and total kinds of strategies used. The coefficient of determination (R^2 = .53, adjusted R^2 = .26) indicated that 53% of the variance in the total kinds of practice strategies used by participants was explained by the predictor variables. Beta weights and significance for each predictor variable are listed in Table 9. None of the predictor variables significantly contributed to the model.

Table 9

Contributions of Predictor Variables to Regression Equation 2

Source	*B*	*SE/B*	β	*T*	*p*
Age	-.27	.55	-.10	-.49	.12
Sex	1.82	1.24	.29	1.47	.63
Instrument Family	2.31	1.11	.37	2.09	.16
Years Playing	-.89	1.21	-.14	-.74	.47
Years Lessons	.44	1.27	.07	.34	.74
Weekly Practice	.20	1.13	.03	.18	.86
Other Instrument Training	.39	1.26	.06	.31	.76
Self-regulation	.14	.09	.29	1.62	.12
Self-efficacy	-.12	.09	-.30	-1.37	.18
Locus of Causal Attributions	-.07	.10	-.14	-.63	.54
Mastery Approach	-.96	.94	-.21	-1.03	.31

Table 9 (Continued)

Contributions of Predictor Variables to Regression Equation 2

Source	*B*	*SE/B*	B	*T*	*P*
Performance Approach	.12	.49	.06	.24	.82
Performance Avoid	1.05	.56	.42	1.86	.08
Implicit Beliefs	.19	.99	.04	.19	.85

Chapter 5: Discussion of Results

In Chapter 5, I will discuss the results described in Chapter 4 as well as the implications. I will compare the present study's results with those of past studies and make recommendations for future research. Intensive musical practice is seen by many instrumentalists as the most important way to increase musical skill, and discovering how to make practice more effective has been the focus of many researchers. The results of past research indicate that what musicians do during practice – the strategies they use – have a greater impact on performance achievement than the time spent practicing (Duke et al., 2009). Self-regulation is used by learners in various domains to facilitate the acquisition and knowledge using cognitive, metacognitive, and motivational strategies (Zimmerman, 2008). Students' motivational beliefs, such as self-efficacy, causal attributions, goal orientation, and implicit intelligence beliefs, impact the use of adaptive or maladaptive learning behaviors. Musicians may benefit from research identifying personal characteristics that could help or hinder effective practice. The purpose of the present study was to determine if the number and kinds practice strategies used by university music students could be predicted by self-regulation, motivational beliefs, or background characteristics.

The research questions used to guide this study were:

1. After controlling for participants' known background characteristics (age, sex, primary instrument, years of playing, years of private lessons, average hr of practice per week, and training on another instrument), do university music students' self-regulatory abilities, self-perceptions and motivational beliefs (self-efficacy, locus of causal attributions, goal orientation, and implicit talent beliefs) predict the number of practice strategies used during a 30-min practice session?

2. After controlling for participants' known background characteristics (age, sex, primary instrument, years of playing, years of private lessons, average hr of practice per week, and training on another instrument), do university music students' self-regulatory abilities, self-perceptions and motivational beliefs (self-efficacy, locus of causal attributions, goal orientation, and implicit talent beliefs) predict the total kinds of practice strategies used during a 30-min practice session?

Discussion of Research Question 1

Results for research question 1 indicated that the combination of predictor variables significantly predicted the total number of strategies used by university music students. The large difference between R^2 and adjusted R^2 (.56 and .30, respectively) indicated that the sample size was not large enough to accommodate the number of predictor variables. Of the predictor variables, the following variables significantly contributed to the model: sex (b = 56.58, p = .01), self-regulation (b = 3.15, p = .04), locus of causal attributions (b = -4.17, p = .03), and performance approach (b = 18.69, p = .04). The unstandardized beta weights indicate that female participants used 56.58 more strategies than males, a one-point increase in self-regulation scores was associated with the use of 3.15 more strategies, a one-point increase in locus of causal attribution scores was associated with the use of 4.17 fewer strategies, and a one-point increase in the average performance approach scores was associated with the use of 18.69 more strategies. The standardized beta weights indicate that these variables had the strongest effect on the number of practice strategies used by participants. The strongest predictor was performance approach goal orientation (β = .57), followed by sex (β = .52), locus of causal attributions (β = -.52), and self-regulation (β = .38). It may be difficult to generalize results for the other predictor variables, as they did not contribute significantly to the model. However, the beta weights for the

predictors indicate that there may be some practical significance for these results. The variables with the largest unstandardized beta weights were sex, primary instrument family, years playing the primary instrument, years of lessons, average hr of practice per week, training on another instrument, performance approach goal orientation, performance avoid goal orientation, and implicit beliefs. Thus, the model predicts that females used 56.58 more strategies than male participants, brass instrumentalists used 10.85 more strategies than woodwind instrumentalists, participants who had been playing for 9 or more years used 22.56 fewer strategies than those who had been playing for less than 9 years, participants who had taken lessons for four or more years used 29.27 fewer strategies than those who had taken lessons for less than four years, participants who practiced 10 or more hr per week used 8.77 fewer strategies than those who practiced for less than 10 hr, and participants with training on another instrument used 32.72 few strategies than those without training on another instrument. Additionally, an increase of one point in the average score for the performance approach goal orientation is associated with an increase in strategy use of 18.69 strategies, a one-point increase in the average score for the performance avoid goal orientation is associated with a decrease of 12.97 total strategies, and a one-point increase in the average score for implicit beliefs is associated with an increase of 25.05 total strategies. The age (b = -.5), self-efficacy score (b = -.39), and mastery approach goal orientation score (b = -2.12) of participants did not seem to impact the total number of strategies used by participants very much.

Background characteristics and strategy use. The background characteristics measured in this study were participants' age, sex, primary instrument, years of playing the primary instrument, years of lessons on the primary instrument, average hr of practice per week, and whether participants had training on another instrument. This study did not find that age of

participants contributed to the model significantly, nor did age have a practical effect on the total number of strategies used. Hallam (2001a) found that grade level predicted participants' strategy use, but the participants in Hallam's study ranged from beginners to college students, so perhaps a wider age range is needed to determine differences in strategy use. Participants' sex contributed significantly to the model, with female participants using 56.58 more strategies than male participants. Nielsen (2004) found that female students used more metacognitive strategies than male students. While not contributing significantly to the model, the beta weight for instrument family indicates that brass instrumentalists used more strategies than woodwind instrumentalists. This finding is in contrast to Nielsen (2004), who found that instrument group seemed not to have an impact on students' use of strategies. Students tend to use strategies that applied professors model and reinforce; it may be that some of the applied instructors of the brass instrumentalists place more of an emphasis on practice strategies than the woodwind applied instructors. For example, the applied horn professor at one of the institutions regularly presents on effective practicing and encourages students to develop adaptive motivational beliefs. Alternatively, informal observation of the practice sessions seemed to indicate that the participants playing brass instruments struggled with the etude more than the woodwind instrumentalists, which would then lead to the brass instrumentalists needing to use more strategies. The background characteristics of years playing the primary instrument, years of lessons on the primary instrument, average hr of weekly practice, and training on another instrument would seem to be associated with performance achievement due to having more musical experience. This study found that participants with more experience on their instrument and with music in general used fewer strategies. Again, informal observation of the practice sessions indicated that participants who did not struggle with the musical demands of the etude

seemed to use fewer strategies. This may be due to these participants being able to use strategies that take more time, such as playing all the way through the etude. In contrast, participants struggling with the etude may have needed to repeat smaller sections that presented difficulties multiple times.

Self-regulation and strategy use. This study found that participants' self-regulation scores significantly contributed to the model predicting the total number of strategies used by participants. Past research indicates that students who are more self-regulated tend to use more learning strategies. Miksza et al., (2012) rated participants' self-regulation and coded practice strategy use through observation and found that observed self-regulatory behaviors were significantly correlated with certain practice strategies of writing on music, varying tempo, repeating four or more measures, and irrelevant playing. I was not examining the relationship of participants' use of specific strategies to self-regulation, but the findings seem congruent. Fritz and Peklaj (2010) found that participants' self-regulation as well as belief in ability to solve problems in learning music theory correlated with the use of strategies for learning music theory. McPherson and McCormick (1999) reported that participants' self-regulation beliefs impacted amount of practice and the kind of practice (informal vs. formal) participants engaged in, with formal practice involving the use of more cognitive and metacognitive strategies.

Self-efficacy and strategy use. This study did not find that participants' self-efficacy scores contributed significantly to the model predicting strategy use, nor that self-efficacy scores impacted participants' strategy use to any practical degree. Past researchers have found that students' self-efficacy is connected to a variety of adaptive learning behaviors (Bandura, 1982; Hallam, 2002), including strategy use (Fritz & Peklaj, 2010; Nielsen, 2004). However, McCormick and McPherson (2003) found that music students' self-efficacy and cognitive

strategy use had a negative relationship. While Fritz and Peklaj (2010) and Nielsen (2004) found that students scoring higher in self-efficacy were more likely to use learning strategies, students were self-reporting the strategies typically used in learning tasks. It may be that participants know and are therefore able to report the use of more strategies than they were able to use in one 30-min practice session. Also, it could be that participants with higher self-efficacy, accurately assessing their musical abilities, were therefore able to play the etude more easily. Informal observations of the practice sessions indicate that participants who did not struggle with the performance challenges of the etude used fewer strategies, which may explain the incongruent findings regarding self-efficacy. Finally, since self-efficacy scores did not contribute significantly to the model, it may be that the unexpected result is due to chance or sampling error.

Causal attributions and strategy use. This study found that participants' causal attribution scores contributed significantly to the model predicting total number of practice strategies used. As participants made more internal attributions, the total number of strategies used by participants decreased. Participants in the current study made primarily internal attributions for successful musical practice, which correlates with past research (Asmus, 1985, 1986a; Dick, 2006; Schmidt, 2005). It may be difficult to predict observed practice behaviors with causal attributions if participants make primarily internal attributions over external attributions. Additionally, there are differences in types of internal attributions that my study did not measure; internal attributions include ability, effort, and strategy attributions, which may impact students' behavior differently. In Austin and Vispoel (1992), participants' strategy and effort attributions correlated with more adaptive predicted behaviors than ability attributions. Since I did not measure whether participants in my study were making strategy, effort, or ability attributions, it

is possible that participants' internal attributions concerned ability. Students making ability attributions tend to use fewer learning strategies, which may explain my results.

Goal orientation and strategy use. Participants had scores for three different goal orientations: mastery approach, performance approach, and performance avoid. The beta weight for participants' mastery approach scores indicated a small decrease in strategy use as scores increased. This finding is incongruent with past research, as other researchers have found that the mastery approach goal orientation - with an emphasis on learning for the sake of learning - is associated with the most adaptive learning behaviors, including strategy use (Miksza, 2009; Smith, 2005). Participants' mastery approach scores were very high, with a mean of 6.47 (highest possible score being 7), so it may that there was not enough variation in participants' scores to predict an increase in strategy use. Additionally, the lack of statistical significance for this predictor may indicate that the result was due to chance or sampling error. This study found that participants' performance approach goal orientation scores contributed significantly to the model predicting participants' practice strategy use; participants with higher average score for performance approach used more strategies. Educational researchers tend to prefer the mastery approach goal orientation in students, but the performance approach goal orientation is also associated with adaptive learning behaviors. Participants were aware that my research concerned practice strategies, so it may be that participants motivated by looking like good musicians used more strategies while being recorded for the research study. While not statistically significant, the beta weight for participants' performance avoid scores indicate that higher scores were correlated with a decrease in strategy use. This is congruent with past research; of the three goal orientations, performance avoid tends to be associated with the most maladaptive learning

behaviors, since students with a performance avoid goal orientation wish to avoid looking like inept musicians (Hatano & Inagaki, 1986).

Implicit beliefs and strategy use. While participants' implicit beliefs scores did not contribute significantly to the model, the beta weight indicates that participants holding growth beliefs about musical talent used more practice strategies, specifically 25.05 more strategies per one-point increase in scores. This correlates with past research showing that growth implicit beliefs are associated with adaptive learning behaviors, including strategy use (Dweck et al., 1995; Hallam, 2002; Smith, 2005).

Discussion of Research Question 2

Results for research question 2 indicated that while the combination of predictor variables did not significantly predict the total kinds of strategies used by university music students, there is a relatively strong correlation between the criterion and predictor variables (R = .75). The large difference between R^2 and adjusted R^2 (.53 and .26, respectively) indicated that the sample size was not large enough to accommodate the number of predictor variables. This model explains 53% of the variance in the number of kinds of strategies used by participants. It may be difficult to generalize results for the individual variables, as they did not contribute significantly to the model. The predictor variables' standardized beta weights indicate that some of the predictors had a stronger impact on the kinds of practice strategies used by participants. The performance avoid goal orientation (β = .42) was the strongest predictor, followed by primary instrument family (β = .37), self-efficacy (β = -.30), self-regulation (β = .29), and sex (β = .29). Also, the unstandardized beta weights indicate that there may be some practical significance to these findings, in that some of the variables have a larger impact on the kinds of strategies used by participants. In examining the demographic data, female participants used 1.82 additional kinds

of strategies than male participants, brass instrumentalists used 2.31 more kinds of strategies than woodwind instrumentalists, and participants who had played their instrument for 9 or more years used .89 fewer kinds of strategies than participants who had played for fewer than 9 years. Age (b = -.27), years of private lessons (b = .44), and training on another instrument (b = .39) seemed not to have as large an effect on the kinds of practice strategies used by participants. In examining the self-regulation and motivational beliefs scores, the mastery approach (b = -.96) and performance avoid (b = 1.05) had the largest effect on the kinds of practice strategies used by participants, as opposed to self-regulation (b = .14), self-efficacy (b = -.12), causal attributions (b = -.07), performance approach (b = .12), and implicit beliefs (b = .19).

Background characteristics and kinds of practice strategies. The background characteristics measured in this study were participants' age, sex, primary instrument, years of playing the primary instrument, years of lessons on the primary instrument, average hr of practice per week, and whether participants had training on another instrument. This study did not find that age of participants contributed to the model significantly, nor did age have a practical effect on the total kinds of strategies used. Participants' sex did not contribute significantly to the model, but the beta weight indicated that female participants used 1.82 more kinds of strategies than male participants. Nielsen (2004) found that male university music students used more critical thinking strategies than female students. While not contributing significantly to the model, the beta weight for instrument family indicates that brass instrumentalists used more kinds strategies than woodwind instrumentalists. As with the findings for research question 1, this result could possibly be explained by the instructional styles of participants' applied professors or the degree of difficulty presented by the etude to different instrument families. Participants who had played their primary instrument for 9 or more years

used .89 fewer kinds of strategies than students who had been playing for less than 9 years. As with the findings for research question 1, this may be due to participants with more musical experience needing to use fewer strategies to deal with the challenges of the etude. Years of lessons on the primary instrument, average hr of weekly practice, and training on another instrument seemed to have neither a statistically significant nor a practical effect on the kinds of practice strategies used by participants.

Self-regulation and kinds of practice strategies. This study found that participants' self-regulation scores did not significantly contribute to the model predicting the total kinds of strategies used by participants, but an increase of approximately 7 points on the self-regulation scale predicts the use of one additional practice strategy. This correlates with past research indicating that students who are more self-regulated tend to use more learning strategies (Fritz & Peklaj, 2010; McPherson & McCormick, 1999; Miksza et al., 2012). Bartolome (2009) and Nielsen (2001) each conducted case studies finding that music students (young recorder players and university organ students, respectively) use a wide variety of self-regulation strategies; I observed the participants in my study using between 12 and 24 different kinds of practice strategies during the course of a 30-min practice session.

Self-efficacy and kinds of practice strategies. This study did not find that participants' self-efficacy scores contributed significantly to the model predicting strategy use, but the beta weight indicates that for an approximately 8-point increase in self-efficacy scores, participants used one less kind of practice strategy. This is incongruent with the findings of some researchers that students' self-efficacy is connected to strategy use (Fritz & Peklaj, 2010; Nielsen, 2004), but there may be inconsistencies in the literature, as McCormick and McPherson (2003) found a negative relationship between self-efficacy and cognitive strategy use. These studies concerned

students' self-reported use of practice strategies, so there may have been a disconnect between what kinds of strategies the participants in my study know about and the kinds of strategies they were able to use during the practice session. It may also be that participants scoring high in musical self-efficacy were accurate in their self-assessment; informal observation of the practice sessions indicated that students who were able to play the etude easily did not need to use as many different kinds of strategies. Since self-efficacy did not contribute significantly to the model, this result could also be due to chance or sampling error.

Causal attributions and kinds of practice strategies. This study did not find that participants' causal attribution scores contributed significantly to the model predicting total kinds of practice strategies used, but the beta weight indicates that for an approximately 14-point increase in causal attribution scores, participants used one less kind of strategy. Past research indicates that internal attributions are associated with adaptive learning behaviors. As noted before, participants' causal attribution scores indicate primarily internal attributions for success or failure in musical practice. It may be that participants' internal attributions were ability attributions rather than effort or strategy use, and ability attributions are typically associated with the use of fewer strategies (Austin & Vispoel, 1992).

Goal orientation and kinds of practice strategies. Participants had scores for three different goals orientations: mastery approach, performance approach, and performance avoid. This study found that participants' goal orientation scores did not contribute significantly to the model predicting participants' practice strategy use. In examining the beta weights, an increase of one point in participants' average mastery approach scores predicted the use of .96 fewer kinds of strategies. This is incongruent with past research demonstrating that students with a stronger mastery approach goal orientation use more practice strategies (Miksza, 2009; Smith,

2005). Goal orientation may possibly be impacted by the goal at hand, where participants strongly agreed that they wanted to master musical skills in general, but considered the etude required for the practice session to be less important and therefore did not use as many kinds of strategies. Also, participants tended to score very high in the mastery approach goal orientation, limiting the variation in scores. In contrast to this study's findings for total number of strategies, the average score for performance approach goal orientation did not impact the kinds of strategies used by participants. The beta weight indicated that participants would have needed an increase of approximately 8 points in performance approach scores to predict the use of one additional practice strategy, but the highest possible score for that scale was a 7. While not statistically significant, the beta weight for participants' performance avoid scores indicate that a one-point increase in the average performance avoid score was associated with the use of approximately one additional practice strategy. This is incongruent with past research finding that the performance avoid goal orientation tends to be associated with the most maladaptive learning behaviors (Hatano & Inagaki, 1986). Participants in this study may have been more motivated by the fear of looking like a bad musician to use more strategies.

Implicit beliefs and kinds of practice strategies. Participants' implicit beliefs scores did not contribute significantly to the model, and the beta weight indicates that an increase of approximately 5 points in the average implicit belief score predicted the use of one additional strategy. While not of great practical significance, this correlates with past research showing that growth implicit beliefs are associated with strategy use (Dweck et al., 1995; Hallam, 2002; Smith, 2005).

Discussion of Descriptive Statistics for Specific Practice Strategies

The descriptive statistics for the practice strategies used by university music students may be of interest to music researchers and educators. Of the strategies on the Practice Strategy Checklist, all participants used "repeat notes," "repeat less than four measures," and "repeat section." Almost all participants used "look through music before starting" ($n = 37$), "mark music" ($n = 38$), "repeat whole etude" ($n = 35$), "body movements" ($n = 35$), and "varying tempo" ($n = 39$). The practice strategies with the highest means (< 5) were "mark music," "use of metronome," "repeat notes," "repeat less than four measures," "repeat more than four measures," "repeat section," "repeat whole etude," "body movements," and "varying tempo."

Barry (2007) found that university music students used slow practice most frequently, including playing the entire piece at a very slow tempo and playing difficult passages slowly. While I did not include slow practice as a separate practice strategy, observed instances of slow practice were categorized as "varying tempo," which was a strategy used by 39 of the 40 participants. Informal observations of the practice sessions indicated that participants who practiced the whole etude or sections of the etude slowly experienced more success in mastering the challenges of the piece. Byo and Cassidy (2008) found that the practice strategies reported by university students most frequently were slow tempo, change something, and isolate problem spots. Out of the nine participants observed by Byo and Cassidy (2008), most participants used the strategies of repetition, slow practice, change something, and isolate problem spots. Participants in this study used a variety of repetition strategies most frequently, and half of the participants used the strategy of "pinpointing difficult sections." Hallam (2004) found that when participants rated their use of specific strategies from 1 to 7 (never to always), the highest rated strategies were "When I make a mistake, I practice the section where I went wrong slowly,"

"When something is difficult, I play it over and over again," "I learn by playing slowly to start with and gradually speeding up," "I know when I have made a mistake," and "I find it easy to concentrate when I practice." Again, "varying tempo" and repetition strategies were frequently used by participants in my study. Rohwer and Polk (2006) found that the strategies most frequently articulated by eighth-grade instrumentalists were repetition, pinpointing difficult sections, practicing slow to fast, and analyzing key/meter. Participants in my study frequently used repetition and varying the tempo. Analyzing the music is not an observable behavior, but participants could have been analyzing while looking through the music or marking their music. Half of the participants in my study used the strategy of "pinpointing difficult sections." Rohwer (2002) found that the most reported practice behaviors of high school instrumentalists were "practicing the piece slowly and then progressively faster," "marking the music with a pencil," and warming up. I specifically asked participants to warm up prior to the recording so as to see the strategies used for rehearsing a specific piece of music, but many participants varied the tempo and marked the music.

In examining the strategies infrequently used by participants, no participants used "write down practice goals" or "organize environment," perhaps due to the restrictions of the study. Practice rooms probably do not require much organization, and I asked participants to warm up prior to the recording, so participants had possibly organized the room to their liking before the recording started. Kim (2010) made the observation that the case study participants seemed to be able to focus better when writing down practice goals; none of the participants in my study wrote down practice goals for their session. It may be that this strategy is not used very often by university music students or it may be that participants in my study did not use that strategy for the research study's etude because a future performance would not be required. Very few

participants used “look up terms in music dictionary” (n = 2), “play rhythm on single pitch” (n = 3), “clap rhythm” (n = 5), or “work on most difficult sections first” (n = 3). The practice strategies with the lowest means (> 1) were “look through music before starting,” “play scale of passage,” “use of tuner,” “use of piano,” “recorded own performance/self-listening,” “look up terms in music dictionary,” “whole-part-whole,” “alternate slow practice with at-tempo practice,” “play rhythm on single pitch,” “counting the beat,” “clap rhythm,” “varying pitch,” “varying other musical element,” “working on most difficult sections first/skipping,” and “end session by playing completely through etude.” Some of the low means can be explained the impracticality of using certain strategies more than once; participants could only “look through music before starting” only one time, for example.

Nielsen (2004) found that university students tended to use resource management strategies the least. The resources available for my participants to manage were tuners, metronomes, piano, recording devices, and a music dictionary. With the exception of the metronome, participants tended not to use these resources when practicing. Byo and Cassidy (2008) found that the practice strategies least frequently reported by university music students were analyze music, memorize, record self, long tones, and scale study, and that none of the observed students recorded themselves. I also found that my participants infrequently used “recorded own performance,” with only 6 students using that strategy. Hallam (2004) found that the strategies rated lowest on a scale of 1 to 7 (never to always) by student musicians were “I try to get a recording of the piece that I am learning so that I can listen to it,” “When I make a mistake I carry on without correcting it,” “I record myself playing and listen to the tapes,” and “I practice with the metronome.” There is no recording of the Watkins-Farnum etude 13 for participants to listen to. I did find that participants infrequently recorded themselves, although

most of the participants used a metronome at some point during the practice sessions. The difference in the use of these practice strategies may be perhaps attributed to the wider range of ages in Hallam's sample, from beginner to college musicians. Rohwer and Polk (2006) that the practice strategies least verbalized by eighth-grade instrumentalists were tune, play music on another instrument, articulation change, practice for tempo with another instrument, rhythm change, whistle, sing, and tap. While few of the participants in my study used a tuner or a piano, some of the university music students did vary other musical elements (n = 13), vary rhythm (n = 18), sing/whistle (n = 24), and use body movements, which included tapping the beat (n = 35). One would hope that university music students would be able to use more strategies than eighth-grade musicians. Rohwer (2002) found that the strategies least frequently reported by high school instrumentalists were "practicing at indicated tempo from the first time play the piece," "tape recording yourself practicing your instrument," and "writing out goals for each practice session." While practicing at the indicated tempo was not measured by the Practice Strategies Checklist, the participants in my study infrequently recorded their performances and none of the participants wrote out practice goals.

Limitations

Several limitations to this study may hinder the reader's ability to generalize from the results. The sample size was too small for the number of predictors. While I made every effort to recruit as many university music students as possible, this study required a significant time commitment from participants. Participants had to spend valuable time practicing an etude that would not require performance for anyone else and then complete a fairly lengthy questionnaire. The type of participant who was willing to invest time and energy into my study perhaps is already highly self-regulated. Participants knew that the study involved practice strategies; here again, the type

of participant willing to spend 30 min practicing continuously may already be interested in effective practice and therefore already be using effective practice strategies. Many of the participants knew me personally because of my association with two of the universities; it may be that some of the participants used more strategies than they normally would because they knew the purpose of the study had to do with practicing and these participants wanted to help me be successful.

In requiring all participants to practice one standardized piece of music, I was attempting to control for the impact that different pieces of music might have on participants' use of practice strategies. On the other hand, this does not allow for differentiation based on students' ability – a student with lower performance skills is likely to practice differently than a student with higher performance skills working on the same piece. Duke et al. (2012) found that the participants with the highest performance achievement rankings used different kinds of strategies than the other participants. Self-regulation and various adaptive motivational beliefs have been found to impact performance achievement; it may be that how well participants were able to perform had a mediating or a moderating effect on use of practice strategies. Clark (2010) also found that participants with higher self-efficacy used more and different kinds of practice strategies, but that self-efficacy was also significantly correlated with performance achievement, indicating that how well students perform may impact the strategies they choose to use.

Furthermore, if students' motivation can be impacted by the specific piece of music that is being practiced, the very fact that I was requiring participants to work on a specific etude unconnected to any externally motivating outcomes may have impacted the types of strategies used. Additionally, past research indicates that participants' belief about the importance of the task is correlated with strategy use (Fritz & Peklaj, 2010; Renwick & McPherson, 2002); while

my participants may have believed that practice is important (an attitude I did not attempt to measure), there may have been a confounding factor in their attitude toward the task assigned them for the study. It may be that because participants were not required to formally perform the etude assigned for the research study, participants were not as invested in the task and therefore either did not use as many or the same kinds of practice strategies as they might if they had practicing other repertoire. My informal impressions of the practice sessions indicate that while most participants were making an effort to do their best in practicing the etude, this sort of practice session (practicing one piece of music exclusively for 30 min) was foreign to most of the participants.

While I instructed participants to practice in the way that they normally would to prepare an etude for their applied professor, the practice sessions were atypical for two reasons. First, informal observations of the practice sessions indicated that most students were not accustomed to practicing one piece of music for 30 min. Most students exhibited signs of fatigue after passing the half-way point. While participants may practice for 30 min, it seems reasonable to expect that they may engage in a variety of musical activities, such as scales or ensemble repertoire in addition to etudes or solos. Additionally, students may normally engage in more off-task behavior such as interacting with friends or checking social media on their mobile devices. While mobile devices provide musicians with a variety of useful resources, such devices can provide distractions as well. Secondly, participants were being video-recorded. While I attempted to place the computer in an unobtrusive position that could also capture practice behaviors, it may be that students did not practice the way they normally do. The most frequent practice behavior in the "Other" category was self-talk. While self-talk is an accepted self-regulatory strategy, some students may have been talking to the camera, explaining reasons

behind their behaviors. While one student in the pilot study forgot about the recording so far as to be checking social media sites for several min, it may be safe to say that the majority of participants never forgot the recording and therefore engaged in far less off-task behavior than normal.

Recommendations for Future Research

This study found that the combination of predictors significantly predicted the number of practice strategies used by university music students and explained 56% of the variance in participants' strategy use. While the combination of predictors did not significantly predict the kinds of practice strategies used by participants, the predictors did explain 53% of the variance. More research may still be warranted to discover what other factors may explain the number and kinds of practice strategies used by university music students. Past research results indicate that students' performance achievement is associated with strategy use, so it may be of interest to determine the nature of the relationship between performance achievement, self-regulation, motivational beliefs, and strategy use. Perhaps performance achievement has a mediating or moderating effect on how students' self-perceptions impact musical practice. It could also be that self-perception mediates or moderates the effect of performance achievement.

The finding that female participants used more strategies and more kinds of strategies than male students may merit further investigation. It may be that female participants were more motivated to use more practice strategies than male students, but without conducting exit interviews, it is difficult to determine reasons for the difference. Informal observation of the practice strategies did not seem to indicate that female students found the etude to be more challenging than male students, but performance achievement was not measured in my study. In addition, my study did not involve an analysis of specific strategies used by groups of

participants. Since Nielsen (2004) found that male students specifically used more critical thinking strategies than females, it may be that the female participants in my study used certain strategies more than males.

The concept of production deficit in musical behavior may provide opportunities for research. The results of this study and those of past studies indicate that students do not always do what they believe they are doing or know that they should do. Developing a means of measuring this phenomenon could be of great use to music education researchers. Investigation into the specifics of why production deficit occurs in music students and means of positively impacting students' production deficit may be useful for music educators struggling with why students do not choose the most effective learning behaviors.

Given past research indicating discrepancies between students' observed behaviors with self-perceptions, future researchers may wish to investigate means of measuring music students' self-regulation, self-efficacy, causal attributions, goal orientations, and implicit beliefs that rely upon observed behaviors or choices rather than self-report. If discrepancies exist between what students believe is true and what is actually true about their internal state, it may be useful to conduct research on music students' self-awareness. Increasing students' self-awareness could perhaps positively impact the use of adaptive learning behaviors, which could be a profitable line of future research.

In comparing the observed practice behaviors of my participants and the results of past research, it appears that some students may struggle with developing aural models of the music that they are practicing. It may be that some strategies are more useful in forming aural models than others. Should students choose to sing through their music, play it on a piano, or listen to recordings? Future researchers may wish to investigate whether certain types of students should

use different types of strategies. Additionally, means of measuring whether students' aural models are accurate and impacting the accuracy of the aural models could be useful to music researchers and educators alike. Accurate aural models may positively impact students' ability to utilize the self-reflection phase of self-regulation.

Implications for Music Educators

The results of this study demonstrate that self-regulation and motivational beliefs contribute to students' use of practice strategies. Furthermore, this study has value in describing the nature of students' self-perceptions and observed practice behaviors. Participants tended to self-report high levels of adaptive self-regulation and motivational beliefs. Music educators may wish to seek means of increasing students' self-regulation through carefully selected learning tasks. Students need opportunities to use self-regulation under the supervision of musical experts (Martinez, 2005). Interventions targeted at the three phases of self-regulation – planning, performance, and self-reflection – may increase students' self-regulatory abilities and the effectiveness of their musical practice. It is important for students to plan out practice sessions (Barry, 1992; Mumford et al., 2001). Ensemble directors can model appropriate goal setting by explaining to students why specific rehearsal goals were chosen. Asking students to track practice goals and reasons for succeeding or failing to meet those goals may also be helpful for students (Randi & Corno, 2000). Questioning students as to which sections of a piece of music will present the most difficulties will help students learn how to analyze music prior to practicing (Cleary & Zimmerman, 2004). During the performance phase of self-regulation, music educators could provide lists of practice strategies to students for reference and make a clear connection between specific musical challenges and effective strategies (Smeltz, 2012). For example, if the rhythms in a piece of music present difficulties, students could refer to the list

and decide to play the rhythms on one note. Explaining which strategies were used to meet rehearsal goals and the rationale could be a way for ensemble directors to model appropriate task strategy choices. Providing different means of monitoring progress while practicing - self-recording, using a mirror, or actively listening – can help students practice more effectively. Asking students to focus more on strategy use and improvement rather than the time of practice sessions should positively impact students' self-regulation as well as their practice skills (Smeltz, 2012). Students may struggle with the self-reflection phase of self-regulation. Providing students with opportunities to evaluate themselves and their peers assists in developing self-evaluation abilities. Questioning students as to the reasons for success or failure at specific musical tasks is a way for music educators to foster reflection. Students also need encouragement to think about what could be done differently in future practice sessions to ensure improvement (Bathgate et al., 2012). Ensemble directors could also model the effective use of self-recording in the self-evaluation process by recording sections of rehearsals and discussing with students the areas for improvement and next steps to be taken. Comparison of students' and teachers' evaluations of musical performances could help increase students' self-evaluation accuracy.

Participants' motivational beliefs contributed to the variation in the use of practice strategies. Music educators may wish to foster adaptive motivational beliefs in students. Students' self-efficacy for musical practice can be increased through mastery experiences; helping students set appropriate goals for practice sessions will should impact students' perceptions of success. For example, students who set goals that are too broad or too unrealistic ("I will be able to play this entire etude perfectly") will likely not meet those goals, lowering those students' self-efficacy for musical practice. Specific, realistic goals ("I will be able to play the difficult section 20 bpm faster") are more likely to lead to mastery experiences and thus to higher self-efficacy. Ensuring

that students make effort and strategy attributions for success or failure in music rather than ability attributions may help motivate students to use more strategies when practicing. Students' causal attributions can be impacted through the feedback provided by music educators; students who are told that failure to perform a rhythm correctly was caused by not using any rhythmic practice strategies are more likely to use those strategies in the future than students who are told that they do not possess strong rhythmic skills. Music educators may also wish to be cautious when applying external pressure to students, as rewards and punishments can negatively impact students' sense of control over musical success and failure (Ryan & Deci, 2000). The participants in this study perceived themselves to have a very strong mastery approach goal orientation. As past research indicates that mastery approach goal orientation positively impacts students' persistence in practicing and use of practice strategies, music educators may consider fostering a mastery approach goal orientation in students (Miksza, 2001; Smith, 2005). Guided practice sessions, where students practice while a more experienced musician supervises and offers feedback, tend to positively impact students' mastery approach goal orientation (Picone, 2012). These guided practice sessions could be conducted in person or perhaps recorded with the educator's feedback give to the student later. In ensemble settings, it may be possible to have older, more experienced students work with younger students to develop practice skills. Feedback should be focused on students' improvement on specific tasks rather than on comparisons between students. Music educators might consider framing errors as opportunities to learn rather than obstacles to foster students' willingness to attempt difficult musical tasks. Participants in this study tended to strongly hold growth beliefs concerning musical talent. Giving students specific actions to take to improve musical abilities should encourage more adaptive growth beliefs, while feedback labeling students as "good" or "bad" musicians should

be avoided. It may be valuable for music educators to describe their own musical journey to students; hearing about how their ensemble director worked to improve improvisatory skills can have a powerful influence on students who may think that they do not possess "good ears."

Participants exhibited the use of many practice strategies as well as a wide variety of practice strategies. In looking at the descriptive statistics for the practice strategies used by participants, it could be useful to pinpoint strategies that students may need help or encouragement to use. For example, though none of the participants wrote down practice goals, Kim (2010) found that students were better able to focus during practice session after writing down practice goals. Many ensemble directors write down rehearsal goals for their students, but it may be useful to explain rehearsal goals in more detail to students so that they understand the value of deciding in advance where to spend their practice time. Music educators can encourage students' use of resource management strategies through modeling and providing lists of resources to students. Students may also need help in learning to evaluate resources; it may be possible to discuss the merits of two different instructional videos or websites in class, guiding students to an accurate assessment of various online resources. Since past research indicates that the use of more kinds of practice strategies is associated with performance achievement, it could be helpful to expand students' range of practice strategies. Ensemble directors might consider trying new strategies during rehearsal to model the use of those strategies for students. Students can also model the use of strategies for one another. Perhaps a music educator could ask students to pair share the strategies that they would use to work on a specific section of music or create a blog where students share practice strategies with one another. Music educators may also wish to ensure that students are using practice strategies effectively – while students appear to be very comfortable using repetition strategies, they may need instruction in how to use repetition wisely rather than

mindlessly repeating notes. Modeling appropriate practice strategies for students can be helpful in closing the gap between what students know and do. Students may also need the opportunity to practice under the supervision of their instructors, with feedback given on how to increase the effectiveness of students' strategy use. Guided practice sessions could be conducted in person or through video. An applied instructor could record voice-over comments for the video of a student's practice session and then ask the student to reflect on the practice session and the feedback. Since students are not always motivated to use the effective practice strategies that require extra time and effort, music educators might consider means of increasing students' motivation to practice. Providing students with the opportunity to choose music seems to boost motivation. Performances also seem to have a positive effect, so incorporating more frequent performance opportunities could be helpful. For example, an ensemble director might consider having small ensembles perform at school board or band booster meetings in addition to the regularly-scheduled large ensemble concerts.

The results of this study have important implications for music educators as well as future research. University music students' self-regulation and motivational beliefs, as well as background characteristics, contribute to the explanation of differences in their use of practice strategies. If practice is indeed the best of all instructors, then helping students learn how to practice effectively might be one of music educators' most important tasks.

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Appendices

Appendix A: IRB Consent Form

Consent to Participate in a Research Study

INFLUENCE OF SELF-REGULATION AND MOTIVATIONAL BELIEFS ON UNIVERSITY MUSIC STUDENTS' USE OF PRACTICE STRATEGIES

WHY ARE YOU BEING INVITED TO TAKE PART IN THIS RESEARCH?

You are being invited to take part in a research study about the influence of self-regulation and motivational beliefs on university music students' use of practice strategies. You are being invited to take part in this research study because you are a university music student who plays a wind instrument. If you volunteer to take part in this study, you will be one of about sixty people to do so.

WHO IS DOING THE STUDY?

The person in charge of this study is Nancy L. Summitt of University of Memphis Department of Music. She is being guided in this research by Ryan A. Fisher. There may be other people on the research team assisting at different times during the study.

WHAT IS THE PURPOSE OF THIS STUDY?

By doing this study, we hope to learn whether there is a relationship between university music students' self-regulation and motivational beliefs and the number of practice strategies used during 30 minutes of practicing.

WHERE IS THE STUDY GOING TO TAKE PLACE AND HOW LONG WILL IT LAST?

The research procedures will be conducted at the Music Building at the university. You will need to come to a practice room one time during the study. This visit will take about forty-five mins which is the total amount of time you will be asked to volunteer for this study.

WHAT WILL YOU BE ASKED TO DO?

The university music students will enter a practice room equipped with a copy of the music (attached), pencils, a metronome, a recording device, and a piano. The researcher will read the instructions to the students (instructions attached), begin the video camera, and leave. Students will practice the music for 30 minutes. At the end of the 30 minutes, the researcher will enter the practice room, give students the Music Student Self-Regulation and Motivational Beliefs questionnaire, and read the instructions for how to complete the questionnaire. Students will be given as much time as they required to complete the questionnaire. When students are finished with the questionnaire, they will hand the questionnaire to the researcher and will then have completed their participation in the pilot study.

WHAT ARE THE POSSIBLE RISKS AND DISCOMFORTS?

To the best of our knowledge, the things you will be doing have no more risk of harm than you would experience in everyday life.

You may find some questions we ask you to be upsetting or stressful. If so, we can tell you about some people who may be able to help you with these feelings.

In addition to the risks listed above, you may experience a previously unknown risk or side effect.

WILL YOU BENEFIT FROM TAKING PART IN THIS STUDY?

There is no guarantee that you will get any benefit from taking part in this study. However, some people have been able to practice more effectively when they have filled out the questionnaire and been video-recorded during a practice session. Your willingness to take part may, in the future, help society as a whole better understand this research topic.

DO YOU HAVE TO TAKE PART IN THE STUDY?

If you decide to take part in the study, it should be because you really want to volunteer. You will not lose any benefits or rights you would normally have if you choose not to volunteer. You can stop at any time during the study and still keep the benefits and rights you had before volunteering. As a student, if you decide not to take part in this study, your choice will have no effect on you academic status or grade in the class.

IF YOU DON'T WANT TO TAKE PART IN THE STUDY, ARE THERE OTHER CHOICES?

If you do not want to be in the study, there are no other choices except not to take part in the study.

WHAT WILL IT COST YOU TO PARTICIPATE?

There are no costs associated with taking part in the study.

WILL YOU RECEIVE ANY REWARDS FOR TAKING PART IN THIS STUDY?

You will not receive any rewards or payment for taking part in the study.

WHO WILL SEE THE INFORMATION THAT YOU GIVE?

We will make every effort to keep private all research records that identify you to the extent allowed by law.

Your information will be combined with information from other people taking part in the study. When we write about the study to share it with other researchers, we will write about the combined information we have gathered. You will not be personally identified in these written materials. We may publish the results of this study; however, we will keep your name and other identifying information private.

We will make every effort to prevent anyone who is not on the research team from knowing that you gave us information, or what that information is. Questionnaires will be stored in a locked filing cabinet in the lead investigator's locked office; videos of practice sessions will be stored on the lead researcher's password-protected computer in her locked office.

We will keep private all research records that identify you to the extent allowed by law. However, there are some circumstances in which we may have to show your information to other people. For example, the law may require us to show your information to a court. Also, we may be required to show information which identifies you to people who need to be sure we have done the research correctly; these would be people from such organizations as the University of Memphis.

CAN YOUR TAKING PART IN THE STUDY END EARLY?

If you decide to take part in the study you still have the right to decide at any time that you no longer want to continue. You will not be treated differently if you decide to stop taking part in the study.

The individuals conducting the study may need to withdraw you from the study. This may occur if you are not able to follow the directions they give you, if they find that your being in the study is more risk than benefit to you, or if the agency funding the study decides to stop the study early for a variety of scientific reasons.

WHAT IF YOU HAVE QUESTIONS, SUGGESTIONS, CONCERNS, OR COMPLAINTS?

Before you decide whether to accept this invitation to take part in the study, please ask any questions that might come to mind now. Later, if you have questions, suggestions, concerns, or complaints about the study, you can contact the investigator, Nancy L. Summitt at nlsmmitt@memphis.edu. You can also contact the faculty advisor, Dr. Ryan A. Fisher at rfisher3@memphis.edu. If you have any questions about your rights as a volunteer in this research, contact the Institutional Review Board staff at the University of Memphis at 901-678-2705. We will give you a signed copy of this consent form to take with you.

_____ _____

Signature of person agreeing to take part in the study Date

_____

Printed name of person agreeing to take part in the study

_____ _____

Name of [authorized] person obtaining informed consent Date

Appendix B: IRB Approval Letter

Institutional Review Board

Office of Sponsored Programs

University of Memphis

315 Admin Bldg

Memphis, TN 38152-3370

Mar 10, 2017

PI Name: Nancy Summitt

Co-Investigators:

Advisor and/or Co-PI: Ryan Fisher

Submission Type: Initial

Title: Influence of Self-Regulation and Motivational Beliefs on University Music Students' Use of Practice Strategies

IRB ID **:** #PRO-FY2017-423

Expedited Approval: Mar 10, 2017

Expiration: Mar 10, 2018

Approval of this project is given with the following obligations:

1. This IRB approval has an expiration date, an approved renewal must be in effect to continue the project prior to that date. If approval is not obtained, the human consent form(s) and recruiting material(s) are no longer valid and any research activities involving human subjects must stop.

2. When the project is finished or terminated, a completion form must be submitted.

3. No change may be made in the approved protocol without prior board approval.

Thank you,

James P. Whelan, Ph.D.

Institutional Review Board Chair

The University of Memphis.

Appendix C: Self-regulation and Motivational Beliefs Scales

Music Student Self-Regulation and Motivational Beliefs Questionnaire

School:	**Code #:**

Please complete the following questionnaire by placing a cross in the box that most accurately reflects your beliefs.	Strongly agree			Neither agree nor disagree			Strongly disagree
Self-Regulation							
1. When I learn a piece, I spend most of my time practicing the most difficult sections.							
2. I usually have a plan of what I need to practice most before I begin my practice session.							
3. I listen to my own playing while I practice to make sure I am not reinforcing band habits.							
4. I think about pieces I'm practicing by singing them through in my mind.							
5. I try to be methodical when practicing difficult musical passages.							
6. I break the music I practice into short sections and work on them separately.							

Please complete the following questionnaire by placing a cross in the box that most accurately reflects your beliefs.	Strongly agree			Neither agree nor disagree			Strongly disagree
7. When I'm practicing, I often stop playing and try to think about the best way to work out a problem.							
8. I mark my music regularly as a part of practicing.							
9. I keep a written record of my practice goals.							
Self-Efficacy							
10. No musical task is too difficult for me.							
11. Compared with others in band I think I am a good musician.							
12. I believe I can become unusually good on my instrument.							
13. When I set musical goals for myself, I am sure I can achieve them.							
14. I expect to be known as a good musician.							
15. I feel I can solve any musical problem I encounter.							
16. I expect to do well in music in the future.							
17. I am confident in my ability to improve on my instrument.							
18. Compared with other band students, I expect to do well.							
Causal Attributions							
19. The effectiveness of my practicing is due to my own natural musical ability.							
20. I cannot say why my practice is good or bad, some days I am lucky and some days I am not.							
21. Whether or not I succeed in music has little to do with my practicing.							

Please complete the following questionnaire by placing a cross in the box that most accurately reflects your beliefs.	Strongly agree			Neither agree nor disagree			Strongly disagree
22. I believe that I can stop myself from developing bad practice habits.							
23. Practicing well is a result of my own personal hard work.							
24. Whether or not I practice effectively has to do more with luck than anything else.							
25. If I practice hard enough I can learn to play anything.							
26. It is useless for me to practice hard because most people are better musicians than I am.							
27. When my practice is successful, it is because I used effective practice strategies.							
Goal Orientation							
28. It's important to me that I learn a lot of new musical concepts this year.							
29. One of my goals in band and applied lessons is to learn as much as I can.							
30. One of my goals is to master a lot of new musical skills this year.							
31. It's important to me that I thoroughly understand my assigned music.							
32. It's important to me that improve my musical skills this year.							
33. It's important to me that other students in my class think I am good at my music.							
34. One of my goals is to show others that I'm good at playing my music.							
35. One of my goals is to show others that music is easy for me.							

Please complete the following questionnaire by placing a cross in the box that most accurately reflects your beliefs.	Strongly agree			Neither agree nor disagree			Strongly disagree
36. One of my goals is to look like a good musician in comparison to the other music students.							
37. It's important to me that I look like a good musician compared to others in my class.							
38. I would prefer to play music that is familiar to me, rather than music I would have to learn how to do.							
39. I don't like to learn a lot of new musical concepts in band or applied lessons.							
40. I prefer to practice as I have always done it, rather than trying something new.							
41. I like musical pieces that are familiar to me, rather than those I haven't played before.							
42. I would choose music I knew I could perform, rather than music I haven't done before.							
43. It's very important to me that I don't look like a bad musician in band or applied lessons.							
44. An important reason I practice is so that I don't embarrass myself.							
45. The reason I practice my music is so my teacher doesn't think I am a worse performer than the other music students.							
46. The reason I practice is so others won't think I am a bad musician.							
47. One of my main goals is to avoid looking like I can't play my music.							
48. One reason I would not participate in band is to avoid looking like a bad musician.							
Implicit Beliefs							

Please complete the following questionnaire by placing a cross in the box that most accurately reflects your beliefs.	Strongly agree			Neither agree nor disagree			Strongly disagree
49. I don't think I personally can do much to increase my musical ability.							
50. My musical ability is something about me that I personally can't change very much.							
51. To be honest, I don't think I can really change how musically talented I am.							
52. I can learn new things but I don't have the ability to change my basic musical talent.							
53. With enough time and effort, I think I could significantly improve my musical ability.							
54. I believe I can always substantially improve on my musical talent.							
55. Regardless of my current musical ability, I think I have the capacity to change it quite a bit.							
56. I believe I have the ability to change my basic musical talent considerably over time.							

Personal Information

1. In years, how old are you? _____

2. Sex (circle one): Male Female

3. How would you characterize your major?

☐ Music - Performance

☐ Music - Education

☐ Music - Business

☐ Music - Composition

☐ Music - Conducting

☐ Other, please specify:

4. Primary Instrument: _____

5. Years playing your primary instrument: _____

6. Years of private lessons on your primary instrument: _____

7. Average hr of practice on primary instrument per week: _____

8. Training on another instrument/voice: Yes No

If yes, which instrument/voice? _____

Appendix D: Practice Strategies Check Sheet

Practice Strategies Check Sheet:

Make one mark for every example of a practice strategy you observe. If you observe a strategy not on the list, describe the strategy under "Other" and make a mark for every example of that strategy you observe.

Practice Strategies		Number of Observed Examples
Prepratory Strategies		
	Write down practice goals/ Set goals	
	Organize environment	
	Look through music before starting	
	Play scale of passage	
Resource Strategies		
	Use of tuner	
	Use of piano	
	Mark music	
	Recorded own performance/self-listening	
	Look up terms in music dictionary	
	Use of metronome	
Repetition Strategies		
	Repeat notes	
	Repeat less than four measures	
	Repeat more than four measures	
	Repeat section	

	Play section certain number of times correctly before moving on	
	Whole-part-whole	
	Chaining	
	Repeat whole etude	
	Alternate slow practice with at-tempo practice	
Rhythm Strategies		
	Bop/speak rhythm	
	Play rhythm on single pitch	
	Body movements (tapping foot, etc.)	
	Wind patterns	
	Counting the beat	
	Clap rhythm	
Alteration Strategies		
	Varying pitch	
	Varying rhythm	
	Varying tempo	
	Varying other musical element (articulation, dynamics)	
Audiation/ Mental Model Strategies		
	Singing/whistling	
	Silent fingering	
Miscellaneous Strategies		
	Work on most difficult sections first/skipping	

	Pinpointing difficult sections	
	End session by playing completely through piece	
Other		

Appendix E: Sources for Practice Strategies Checklist Items

	Rohwer (2002)	Rohwer & Polk (2006)	Miksza, Prichard, & Sorbo (2012)	Miksza (2007)	Barry (2007)	Personal experience
Write down practice goals/ Set goals	X					
Organize environment						X
Look through music before starting					X	
Play scale of passage					X	
Use of tuner	X	X	X			
Use of piano		X				
Mark music	X	X	X	X		
Recorded own performance/self-listening	X				X	
Look up terms in music dictionary					X	
Use of metronome	X		X	X	X	
Repeat notes						X
Repeat less than four measures			X			
Repeat more than four measures			X			
Repeat section				X		
Play section certain number of times correctly before moving on						X
Whole-part-whole			X	X		
Chaining			X	X		

Repeat whole etude				X		
Alternate slow practice with at-tempo practice	X					
Bop/speak rhythm			X			
Play rhythm on single pitch			X			
Body movements (tapping foot, etc.)		X	X			
Wind patterns			X			
Counting the beat		X	X			
Clap rhythm	X					
Varying pitch				X		
Varying rhythm		X	X	X		
Varying tempo			X			
Varying other musical element (articulation, dynamics)	X	X	X	X		
Singing/whistling	X	X	X	X		
Silent fingering	X	X	X		X	
Work on most difficult sections first/skipping				X		
Pinpointing difficult sections		X			X	
End session by playing completely through piece	X				X	

Appendix F: Reasons for Exclusion of Practice Strategies from the Checklist

		Too specific/general; covered under another term	Did not fit the methodology of current study	Not observable	Overlooked
Rohwer & Polk (2006)					
	Repetition	X			
	Analyzing music			X (not possible to determine whether analyzing or not based on observation)	
	Practicing slow to fast	X			
	Look up notes			X	
	Write in notes			X	
	Silent study				X
	Practice for tempo with another instrument			X	
Rohwer (2002)					
	Practice the piece slowly and then get faster	X			
	Warm up		X		

	Practice in a place without disruptions		X		
	Start practicing from beginning of the piece	X			
	Mentally rehearse a section without performing it			X	
	Practice continuously until you are tired		X		
	Practice at the same time each day		X		
	Listen to a recording				X
	Practice at the indicated tempo from the 1st time you play a piece	X			
Miksza, Prichard, & Sorbo (2012)					
	Irrelevant playing		X		
	Finding partial	X (specific to brass players; covered under "repeat notes")			

	Buzzing	X (specific to brass players; can be written in as “other”)			
Miksza (2007)					
	Repeat measure	X			
	Slowing	X			
	Non-etude related playing		X		
Barry (2007)					
	Playing through entire piece first	X			
	Mark bowings, fingerings	X			
	Try to hear piece in head (audiation)			X	
	Play slowly, stopping to work out difficult sections using the metronome	X			
	Practice memorization		X		
	Gradually increase tempo	X			