

THE EFFECTS OF PRACTICE AND MEMORIZATION TECHNIQUES ON GOAL
SPECIFICITY AMONG NOVICE STRING STUDENTS

By

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Abstract

The purpose of this problem-driven content analysis was to examine differences between self-reported goals of novice high school orchestra students ($N = 31$) when given directions to either practice or memorize music during a 10-minute rehearsal. Participants were then interviewed about their definition of practice or memorization, what they did during rehearsal, and what they had planned to do during rehearsal. Findings from a Mann-Whitney U indicated no significant difference between median goal specificity among practicers and memorizers; however, results of interview coding revealed that participants who memorized demonstrated distinctly different rehearsal behaviors and goals than those who practiced, indicating unique strengths associated with each instruction. Profiles of what educators can expect to see from memorizers and practicers are included, and other implications for educators regarding deliberate practice are discussed.

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Chapter 1

INTRODUCTION

Music educators must teach students how to practice. Classroom instructional time is limited, thus acquiring the necessary quantity of quality practice time requires students to practice outside of the classroom. To ensure some degree of quality, teachers model effective habits, assign practice charts, and use technology that demonstrates practice skills. Ultimately though, practice outside of class is independent and controlled by the student. Thus, the development of musical ability requires self-monitored practice. To practice effectively, students must self-regulate their learning, a process that is initiated, in part, by setting specific goals that direct the practice session (Zimmerman, 2012). Scholars suggest, however, that students have difficulties articulating such goals, tending to play straight from beginning to end during practice (Hallam, 2001; McPherson & Renwick, 2001; Miksza, 2011).

One rehearsal process that includes substantial self-regulation is memorization. During the memorization process, students tend to self-evaluate in order to determine if the material is memorized or not (Hallam, 1997, Mishra, 2010). Because students are self-evaluating, they must also be setting goals beforehand (Zimmerman, 2012). Thus, one way teachers could help students enhance self-regulation skills and engage in more specific goal-setting behaviors during self-monitored practice may be by asking them to memorize their music.

Self-regulation refers to the cyclical self-directed processes and beliefs that enable learners to convert their mental abilities and perceptions into an academic performance skill (Zimmerman, 2008). Novice students employ a wide variety of self-directed rehearsal strategies when memorizing music, including segmentation, whole-part-whole, self-assessment, and over-learning through repetition (Hallam, 1997). Grouped together in various combinations, the

demonstration of these memorization-based rehearsal strategies implies that students are evaluating their performance and setting goals that arise as a result of their evaluation, which may suggest that they are self-regulating effectively. Further research, however, is needed to conclude that the use of more specific rehearsal strategies indicates stronger goal-setting skills. In this study, I argue that because the characteristics of memorization as a learning process may increase student self-regulation, memorization may yield more specific goals for students than practice.

Self-regulated Learning

Setting goals initiates self-regulated learning, which is a cyclical process describing how learners monitor, direct, and regulate actions toward a goal using forethought, performance, and self-reflection (Paris & Paris, 2001; Zimmerman, 2012). *Forethought* includes task analysis processes and self-motivation beliefs, such as goal setting, strategic planning, self-efficacy, and outcome expectations. Forethought precedes learning efforts and seeks to enhance those efforts. *Performance*, which happens during learning efforts, involves attention focusing, self-observation, and self-instruction. *Self-reflection* tries to make sense of the performance phase processes and occurs after learning efforts. Self-reflection may include self-evaluation, causal attribution, and self-reactions; these efforts then influence forethought processes in the next self-regulatory phase, completing the self-regulated learning cycle (Zimmerman, 2012).

Practice

Self-regulation in music learning is initiated through self-monitored practice, broadly defined as “individually oriented self-directed study, no matter how strictly, with the purpose of attaining musical proficiency on an instrument or voice” (Miksza, 2011, p. 52). This definition, however, does not account for all aspects of self-regulation. A more comprehensive definition

comes from the performance achievement literature, where self-regulated practice is referred to as deliberate practice.

Deliberate practice is a “structured activity...with the explicit goal of increasing an individual’s current level of performance” (Ericsson & Lehmann, 1999, p. 695). It requires generating specific goals for improvement and monitoring various aspects of performance. Deliberate practice also involves trying to exceed the individual’s previous performance limits, which requires full concentration and effort (Ericsson, Krampe, & Tesch-Romer, 1993; Lehmann & Ericsson, 1997). Ericsson et al. (1993) developed a model of deliberate practice similar to that of the self-regulation model, which includes three self-teaching activities: planning and preparation, execution, and observation and evaluation. Learners require a well-defined task at an appropriate level of difficulty, informative feedback, and opportunities for repetition.

Although deliberate practice is effortful and not inherently enjoyable, learners are motivated to work by their desire for improvement (Lehmann, 2002; Sloboda et al., 1996). This type of practice can only be sustained for limited periods of time before leading to exhaustion because it requires extreme mental concentration and effort (Ericsson et al., 1993).

Goal-Setting

The self-regulatory cycle and deliberate practice both begin with goal setting. Goal setting is a forethought process designed to enhance learning efforts. A goal is “the object or aim of an action,” or what an individual is consciously trying to accomplish (Schunk, 1990; Locke & Latham, 2002). Learners set a standard of proficiency for themselves as a source of feedback about their effectiveness during the self-regulatory cycle. In order for a goal to aid learning, it must be advantageous to the learner. Zimmerman (2012) suggests eight key properties of advantageous goals: specificity, temporal proximity, hierarchical organization, congruence

among goals, difficulty, self-assigned origin, consciousness, and focus on learning processes or performance outcomes.

This study focuses on the first quality of advantageous goals: specificity. Specific goals are more effective than vague goals because progress toward the goal is easier for the student to measure (Zimmerman, 2012). Goals that incorporate specific performance standards are therefore more likely to enhance self-regulation than general goals, such as “do my best” or “try hard” (Locke & Latham, 1990; Zimmerman, 2012).

Researchers indicate novice students have difficulties articulating goals that describe their practice (Hallam, 1997; McPherson & Renwick, 2001; 2002, Pitts, 2000a; 2000b). Most students employ a solely holistic practice method by playing straight through the music without stopping to correct errors with very little specific performance preparation (McPherson & Renwick, 2001; McPherson & Zimmerman, 2002). In contrast, highly self-regulated musicians consciously employ a variety of more sophisticated and musically appropriate strategies to achieve specific goals during rehearsal (McPherson & Zimmerman, 2002).

Students who employ self-regulated practice behaviors set more specific goals for themselves (Miksza, 2011). Self-regulated practice behaviors include metacognitive thinking, analysis of musical problems, organization of practice, and an ability to concentrate (Hallam, 2001). Beginners may avoid material that requires applying self-regulated behaviors to improve (Renwick & McPherson, 2002), and even when students demonstrate self-awareness, they still may not have strategies available or be able to draw upon strategies that help them improve (McPherson & Zimmerman, 2002; Pitts et al., 2001). Fortunately, as students become more proficient, they are better able to self-regulate their practice (McPherson, 2005). One way novice students may become better self-regulators is through the process of memorization.

Memorization

Memorization, from a cognitive psychological perspective, involves the encoding, storage, and retrieval of information (Dakon & Dvorak, 2014; Lehmann & Gruber, 2006). *Encoding* refers to the initial experience of perceiving and learning information (Tulving & Thomson, 1973). For musicians, new information can be encoded in terms of schema already stored in memory, such as the familiar patterns of chords, scales, and arpeggios (Chaffin et al., 2009). *Storage* is concerned with where the encoded information goes, how long the memory lasts, how much information can be stored, and what kind of information is held (Miller, 1956). *Retrieval* takes place when an individual recalls previously encoded information from memory storage (Schacter, 2007).

Among music scholars, there is a tendency to think of memorization solely as “the faithful reproduction of preexisting material void of the stimuli from which the material was learned” (Dakon & Dvorak, 2014, p. 31). This definition, however, confines memorization to a ‘subskill of music performance’ centered only on recall-based retrieval and ignores its value as a learning tool that also involves encoding, storage, and recognition-based recall. This study will use the cognitive psychological definition of memorization as a learning tool that encompasses encoding, storage, and retrieval processes.

Although novice practicers tend to use a limited repertoire of rehearsal strategies, research suggests that novice memorizers¹ may employ a wider variety of rehearsal strategies when they memorize (Hallam, 1997). These students report strategies such as looking through the music, repetition, breaking the music into smaller segments (segmental strategy), and testing

¹ Novice memorizers are individuals who have little experience engaging in the process of memorization.

themselves (Hallam, 1997; Dakon, 2013; Ginsborg, 2002). Similarly, Chaffin et al. (2009) illustrate how an expert cellist used memorization by dividing a piece into segments and then re-integrating the segments into a whole. These strategies suggest that memorizers are self-regulating by evaluating their performance and setting goals that arise as a result of their evaluation. Because memorizers have a richer repertoire of more specific rehearsal strategies, indicating a stronger ability to set goals, one way students may be able to become better self-regulators is through memorization.

The purpose of this study was to examine differences between self-reported goals of high school orchestra students when given directions to either practice or memorize music during a 10-minute rehearsal. The research questions include: (a) What is the effect of directions (i.e., to practice or to memorize) on levels of specificity in self-reported student goals for individual rehearsal? (b) How do the directions to practice or to memorize impact self-reported student use of rehearsal strategies during individual rehearsal?

Operational Definitions

Self-regulation- A cyclical process that refers to the self-directed processes and beliefs that enable learners to convert their mental abilities and perceptions into an academic performance skill (Zimmerman, 2008).

Goal- The product that an individual is consciously trying to obtain or accomplish (Locke & Latham, 2002).

Practice- “Individually oriented self-directed study, no matter how strictly, with the purpose of attaining musical proficiency on an instrument or voice” (Miksza, 2011, p. 52).

Practicer- One who engages in the process of practice.

Memorization- The process of encoding, storing, and retrieving information (Dakon & Dvorak, 2014).

Memorizer- One who engages in the process of memorization.

Chapter 2

REVIEW OF LITERATURE

Practice outside of the music classroom is independent and controlled by the student. Consequently, students must develop the ability to practice effectively and independently of the teacher. To practice effectively, students must also learn to self-regulate their learning, a process that is initiated by setting specific goals which direct the practice session (Zimmerman, 2012). Students, however, tend to have difficulties demonstrating specific goals, and instead adopt broader, more general goals such as playing straight from beginning to end during practice (Hallam, 2001; McPherson & Renwick, 2001; Miksza, 2011).

One rehearsal process that includes substantial self-regulation is memorization. During the memorization process, students self-evaluate in order to determine if the material is memorized or not (Hallam, 1997, Mishra, 2010). Because students self-evaluate, they must also set goals beforehand (Zimmerman, 2012). Thus, one way students could enhance self-regulatory and goal-setting skills may be by engaging the process of memorization.

Research suggests that novice memorizers adopt a variety of rehearsal strategies when memorizing music that closely align with expert deliberate practice techniques (Dakon, 2013; Hallam, 1997). Employing these strategies suggests that students who are memorizing music may be self-regulating by evaluating their performance and setting goals that arise as a result of their evaluation. To date, however, no study has conclusively asserted that the use of richer rehearsal strategies indicates stronger goal setting. In this study, I argue that because the characteristics of memorization as a learning process appear to increase student self-regulation, memorization may yield more specific goals for students than practice.

In this chapter, I will review research on how self-regulated learning and goal setting manifest themselves in music learning. I will first discuss applications of self-regulation in deliberate musical practice. Then I will review evidence on goal setting, focusing specifically on how novice musicians set goals during practice. Finally, I will describe the process of memorization and how novice musicians memorize music.

Self-regulated Learning

To practice effectively, students work to become self-sufficient learners. Self-sufficient learning occurs through a cyclical process called self-regulation. In this process, learner behavior is motivated and regulated by internal goals and reactions to their own actions. Once a learner has adopted a personal goal for an activity, discrepancies between his performance and the goal he has set prompt self-evaluative reactions, which in turn influence subsequent behaviors (McPherson & Zimmerman, 2011). The concept of self-regulation was first developed in Social Cognitive Theory (Bandura, 1986) and further developed by Zimmerman, who defined self-regulated learning (SRL) as “self-directive processes and self-beliefs that enable learners to transform their mental abilities into an academic performance skill” (Zimmerman, 2008, p. 166). In the self-regulated learning process, students become metacognitively, motivationally, and behaviorally active participants in their own learning process by planning, executing, and evaluating their performance (Zimmerman, 1986; Zimmerman, 1990). Working within a social cognitive framework, self-regulation can be viewed as consisting of three sub-processes, namely forethought, performance, and self-reflection (Bandura, 1986; Schunk, 1990; Zimmerman, 2012). Learners develop goals and self-motivation in the forethought phase, then use self-control and self-observation to maintain focus and metacognitively monitor themselves in the performance phase. This proceeds into the self-reflection phase, during which the learner

evaluates the quality of work, determines the causes for the results, and reacts to the results. This phase then leads back into the forethought phase for the next logical step in learning.

Within each phase, students learn to implement knowledge appropriately and select processes that help them personally adapt to each learning task. These component skills include: (a) setting specific goals for the task, (b) selecting appropriate strategies for attaining the goals, (c) monitoring performance for signs of improvement or problems, (d) managing time efficiently, (e) self-evaluating the strategies previously selected, (f) attributing causation to results, and (g) adapting future methods (Zimmerman, 2012). For example, a child might set a goal to learn 10 vocabulary words for the week. The child creates flashcards with the word on one side and the definition on the other, then quizzes himself by reading the word, saying the definition out loud, and flipping the card over to check himself. He puts the words he does not know in a separate stack and works on these twice more before incorporating them back into the full deck. He knows this strategy is working when he gradually remembers more definitions each time he works through the cards. The next day, he adapts his strategy by reading the definition, saying the word out loud, and flipping the card over to check himself.

Students' personal capacity to self-regulate depends on learning and development. Older and more experienced learners are better able to regulate their own learning (Bandura, 1986; McPherson & Zimmerman, 2011). The acquisition of self-regulatory skills starts early however, as processes become more cyclical with increasing age and experience (McPherson & Zimmerman, 2011). Zimmerman (2000) proposes four developmental levels of regulatory skill. Level one, *observation*, involves vicarious introduction to a skill by watching a proficient model. In level two, learners *emulate* a model with social assistance. Modeling and social feedback enable the player to learn to control his or her practice efforts. Level three involves *self-*

controlled efforts to practice the skill within structured conditions, such as working from an instrumental method book. At level four, students are able to *self-regulate* across changing personal and environmental conditions. Zimmerman's model clarifies more precisely how students develop into self-regulated musicians, and provides insight as to how teachers can further help novice learners self-regulate more completely.

Practice

Self-regulation is operationalized in music learning through practice. In its most broad, and basic form, practice in music learning has been defined as “individually oriented self-directed study, no matter how strictly, with the purpose of attaining musical proficiency on an instrument or voice” (Miksza, 2011, p. 52). This definition, however, does not account for self-regulation. A more comprehensive definition can be found in the performance achievement literature, where self-regulated practice is more commonly referred to as deliberate practice.

Deliberate practice is a “structured activity, often designed by teachers or coaches with the explicit goal of increasing an individual's current level of performance” (Ericsson & Lehmann, 1999, p. 695). It requires the generation of specific goals for improvements and the monitoring of various aspects of performance. Deliberate practice also involves trying to exceed the individual's previous limits, which requires full concentration and effort (Ericsson, Krampe, & Tesch-Romer, 1993; Lehmann & Ericsson, 1997). Ericsson et al. (1993) developed a model of deliberate practice similar to that of the self-regulation model, which includes three self-teaching activities: planning and preparation, execution, and observation and evaluation. Learners require a well-defined task at an appropriate level of difficulty, informative feedback, and opportunities for repetition. A meta-analysis by Platz, Kopiez, Lehmann, and Wolf (2014) found that deliberate practice is strongly related to attained musical performance, in that skill acquisition

and achievement positively correlate with the amount of deliberate practice in which individuals engage.

Unfortunately, deliberate practice is effortful and not inherently enjoyable. Consequently, learners are motivated to continue working by their desire for improvement and not because the practice process itself is enjoyable (Lehmann, 2002; Sloboda et al., 1996). Lehmann (2002) found that learners expend a great degree of effort and concentration on practice tasks such as memorization, technical practice, and problem spot practice, while receiving very little enjoyment from these activities. At the same time, learners believe that these tasks are extremely relevant to their success. Based on these findings, Lehmann argues that the more tedious and inherently less enjoyable aspects of practice are those that actually improve the musician's performing skills the most.

Because deliberate practice requires immense effort and mental concentration, it occurs inconsistently, even among proficient learners, and it can only be sustained for limited amounts of time before leading to exhaustion. Part of the reason for the mental focus required of deliberate practicers is because they must constantly engage in metacognition in order to monitor and control their strategy use and adjust strategies as needed (Ericsson et al., 1993; Lehmann, 2002). The amount of deliberate practice an individual is capable of is limited by his or her attentional resources, but can be increased over time, with experts able to engage in up to four or five hours on a daily basis (Lehmann & Ericsson, 1997).

Goal-Setting

The impetus of deliberate practice and the self-regulatory cycle is goal setting. During the forethought process, individuals set a goal, or "the object or aim of an action" an individual is consciously trying to accomplish (Schunk, 1990; Locke & Latham, 2002, p. 705). The goal then

becomes a source of personal feedback and works to increase rehearsal effectiveness and self-regulatory control (Zimmerman, 2012).

Goal setting also has a strong positive effect on motivation and performance achievement (Bandura & Locke, 2003; Ericsson, et al., 1993; Lehmann & Ericsson, 1997; Pitts, Davison, & McPherson, 2000a). Ericsson, et al. (1993) state that goal setting is highly predictive of self-efficacy. Students who set goals are more likely to develop effective practice strategies and see chances for future success. Students who do not set goals tend to attribute performance failures to uncontrollable personal sources, such as low ability.

Effective goals can be defined by several key properties. According to Schunk (2001), effective goals are specific, temporally proximal, and appropriately challenging. Expanding on these aspects, Zimmerman (2012) identified eight elements of effective goals, which he terms “advantageous goals.” In addition to specificity, temporal proximity, and difficulty, Zimmerman suggests goals must be hierarchically organized, self-assigned, conscious, focus on learning processes or performance outcomes, and congruent with one another.

Table 2.1

Advantageous Properties of Goals

Advantageous Goal Properties <i>Goals that enhance self-regulatory capacity</i>	Examples of Goal Setting
<i>Specificity</i> of goals	<i>Specific goal:</i> I will learn the notes and rhythms in m. 17-30 of this piece. <i>General goal:</i> I will try to learn this piece.
<i>Proximity</i> of goals	<i>Proximal goal:</i> I will learn a 3-octave D Major scale by the end of class. <i>Distal goal:</i> I will learn 3-octave scales up to 5 sharps by the end of the semester.

<i>Hierarchical</i> organization of short- and long-term goals	For my <i>short-term goal</i> , I will memorize the first 5 pieces in my method book, and for my <i>long-term goal</i> , I will decrease the amount of time it takes me to memorize a piece of music.
<i>Congruence</i> or lack of conflict among goals	My goal of playing in the top orchestra at one's school is compatible with my parents' goals for me.
Self-set or assigned <i>origins</i> of goals	<i>Self-set goals</i> : I will earn at least 5 th chair in the state honor band. <i>Assigned goals</i> : My band director expects me to earn at least 5 th chair in the state honor band.
<i>Conscious</i> quality of goals	I am aware of the need to monitor my intonation metacognitively if I want to improve through practice.
<i>Focus</i> of goals on learning processes performance outcomes	My first goal is to focus on <i>learning</i> or strategies for practicing double stops before shifting to <i>performance outcomes</i> , such as playing one of Sarasate's <i>Spanish Dances</i> for violin.

Adapted from Zimmerman, B. J. (2012). Goal setting: A key proactive source of academic self-regulation. In D. H. Schunk & B. J. Zimmerman (Eds.), *Motivation and self-regulated learning: Theory, research, and applications* (pp. 267-295). New York: Routledge.

The present study focuses on the first quality of advantageous goals: goal specificity. Specific goals, or those that clearly define a measurable performance outcome, exist in opposition to general goals, or “do my best” goals. Goals that incorporate specific performance standards are more likely to enhance self-regulation than general goals, such as “do my best” or “try hard” (Locke & Latham, 2002; Schunk, 2001; Zimmerman, 2012). Specific difficult goals have been shown to increase performance on over 100 different tasks involving more than 40,000 participants in at least eight countries working in laboratory, simulation, and field settings

(Locke & Latham, 2002). Specific goals are more effective because progress toward the goal is easier to measure (Zimmerman, 2012). These goals specify the amount of effort required for success and boost the learner's self-efficacy by providing a clear performance standard against which learners can measure progress. In contrast, general goals do not reliably enhance academic attainment (Barry & McArthur, 1994; Schunk, 1989; Zimmerman & Martinez-Pons, 1986, 1988).

Goal-Setting in Novice Practice

Research has shown that practice is more effective when it is goal-oriented and directly related to the task being practiced (Barry & McArthur, 1994). Rohwer and Polk (2006) looked at the practice behaviors and strategies used by 13- to 14-year-old instrumental musicians. The students who ignored errors had the lowest gain in practice score of all the participants and were unable to articulate practice strategies they used beyond repetition. In contrast, students who stopped to intentionally repeat and remediate sections had the largest gains in practice score and were able to identify several practice strategies.

Novice students tend to have difficulties demonstrating goals that direct practice. A number of studies have found that beginning-level instrumentalists are unlikely to self-regulate their practice. McPherson and Renwick (2001) indicated that novice wind players lacked the ability to control and monitor their own learning during practice. Similarly, in 2002, the same researchers found that novices may altogether avoid material that requires applying self-regulated behaviors. Even highly motivated, self-aware students still may not have the strategies available or be able to use known strategies that help them improve (Pitts et al., 2000a, 2000b). A study by Pitts, Davidson, and McPherson (2000a) showed that after the first 20 months of learning, children who maintained interest and enthusiasm for their instrument typically did not

engage in deliberate practice and did not practice consistently, although they were more aware of their mistakes and the purpose of practice than their peers. The other children in the study, some of whom continued to play their instrument and some of whom quit, only practiced sporadically (if at all), and were not aware of the purpose of practice. In a longitudinal case study following three young instrumentalists, Pitts (2000b) found that the students' practice strategies were negligible, even when they were very eager to practice their instruments. The children seemed to have no real idea of why they were playing through their repertoire, even though they all remembered what they had been asked to do, and they were only conscious of difficulties when they struggled or stopped.

Novices also seem unable to detect errors and implement self-corrective strategies. Hallam (1997, 2001, 2001b) has consistently shown that novices tend to play straight through music without stopping to correct errors. In this study, playing straight through a piece of music from beginning to end is identified as a holistic strategy. Comparable findings by Rohwer (2005) and McPherson and Renwick (2001) also indicate that participants had difficulty identifying trouble spots and evaluating their own progress, and that simply playing through a piece of music holistically occurred 90% of the time or more. These deficiencies are evident even after three years of instrumental study (McPherson & Renwick, 2001).

Most novice musicians are not self-motivated to practice and view practice as a chore similar to homework (Miksza, 2011; Sloboda, Davidson, Howe, & Moore, 1996; McPherson & Davidson, 2002). Sloboda and Howe (1991) suggest that while most students enjoy performing, they have a hard time maintaining concentration in practice. Hallam (1995) studied professional musicians and found that even these high-level players did not all practice regularly, needed an external goal for motivation, and did not use a set practice routine.

Fortunately, as students gain competence on their instrument, they also become better self-regulators of their practice (McPherson, 1997, 2005; McPherson & McCormick, 2000). In a three-year longitudinal study of high school instrumentalists, McPherson (1997) found that the best musicians displayed a mature level of metacognitive ability and possessed a rich repertoire of strategies which they used when rehearsing. Similarly, McPherson (2005) showed that relevant mental strategies and task-appropriate strategies were predictors of higher student achievement, which aligns with McPherson and McCormick's study (2000), wherein self-regulation was a significant predictor of performance achievement.

In addition to a lack of intrinsic motivation and an inability to identify errors, students' conceptions of practice do not often align with their teachers' expectations. Although teachers report modeling practice strategies in lessons, Barry (2007) found that instructors were not likely to teach practice strategies, and that students' descriptions of how to practice were not as detailed as their teacher's descriptions. Kostka (2002) found similar results in a study of university music majors, in which 94% of teachers expected their students to use a regular practice routine, but 55% of students did not do so. Almost all the teachers stated that they discussed practice strategies with their students, but 67% of students reported that practice strategies were not discussed in their lessons.

Referring back to Ericsson's model of deliberate practice, the sum of these studies suggest that novice practicers lack several key skills that align with successful deliberate practice. They are unable to articulate practice goals, vary their practice strategy beyond holistic repetition, or understand the purpose of practice, instead viewing it as a chore. One way students could engage in more deliberate practice is through the process of memorization.

Memorization

Memorization, from a cognitive psychological perspective, is the process of encoding, storing, and retrieving information (Cowan, 2008; Tulving, 1995). Memory provides a representation of past experiences that persists over time, directing decisions, behaviors, and actions in the present (Schacter, 2007). This definition of memorization is often confounded in music performance literature with the term playing-from-memory (PfM), defined as “providing a faithful reproduction of a pre-existing piece of music that was learned from notation but performed without notation.” (Dakon & Dvorak, 2014; Dakon, 2016; McPherson, 2005, p. 9). Memorization and PfM are not synonymous, although memorization provides the context in which PfM occurs (Dakon, 2016). Musicians who wish to play from memory must engage in the process of memorization, but the inverse is not always true; learners who memorize music are not obligated to play from memory in performance. In the present study, participants memorized music and were also asked to play from memory.

Researchers have spent a great deal of time and ink discussing how musicians engage in memorization during self-monitored rehearsal. Hallam (1997) found that most student musicians used repetition to memorize, especially novice players. Unlike novice practicers, however, who used holistic repetition to learn, novice memorizers broke the music down into chunks and tested themselves (self-evaluated) as they added the chunks back together. More advanced students repeated a passage until their fingers knew where to go automatically, a phenomenon Hallam calls “over-learning through repetition.” Other students visualized the music as they played, or followed along aurally with “what it should sound like.” Further research by Mishra (2011) categorized memorization strategies in four ways: (a) holistic- playing the music beginning to end repeatedly, (b) segmented- practicing isolated sections of the piece, then adding the

segments together, (c) serial- starting at the beginning and playing until an error occurs, then returning to the beginning for another attempt, and (d) additive- initially memorizing one segment, then systematically increasing the length until the segment encompasses the entire piece. Dakon (2013) reinforced the strategies outlined by Mishra in a study of beginning-level string students. He found that successful participants adopted a segmental strategy and gradually introduced holistic attempts at the end of the rehearsal session. Some participants also sang, chanted, vocalized rests, and altered the tempo of the piece, although these were used more infrequently.

If students are able to use more strategies while memorizing than practicing, it is likely these students are implementing the strategies based off more specific goals. Given the variety of strategies used by novice memorizers, this literature would lead us to believe that memorization offers a viable alternative that may help students set more specific goals during practice, and by extension, demonstrate more characteristics of deliberate practice.

The purpose of this study was to compare differences between self-reported goals of high school orchestra students when given directions to either practice or memorize music during a 10-minute rehearsal. The research questions include: (a) What is the effect of directions (i.e., to practice or to memorize) on levels of specificity in self-reported student goals for individual rehearsal? (b) What is the effect of directions (i.e., to practice or to memorize) on self-reported student use of rehearsal strategies during individual rehearsal?

Chapter 3

METHOD

Purpose and Research Questions

The purpose of this study was to compare differences between self-reported goals of high school orchestra students when given directions to either practice or memorize music during a 10-minute rehearsal. The research questions include: (a) What is the effect of directions (i.e., to practice or to memorize) on levels of specificity in self-reported student goals for individual rehearsal? (b) How do directions to practice or to memorize impact self-reported student use of rehearsal strategies during individual rehearsal?

Informed Consent and Recruitment

To recruit participants, I discussed the experiment with potential participants during the participating orchestras' class times. Interested students were given an IRB-approved written informed consent document (see Appendix D) to take home to their parents. Students had two weeks to return consent forms signed by their parent or guardian. Additionally, student participants were read and agreed to a verbal consent statement before beginning the experimental procedure (see Appendix E).

Design

This experiment is best classified as a problem-driven content analysis (Krippendorff, 2013). Problem-driven content analyses deal with “real world problems” by locating relevant texts, identifying relevant units in the texts, sampling these units, and developing coding categories that reflect the data from the texts (Krippendorff, 2013, p. 358). Data were derived from interview transcripts and analyzed both qualitatively and quantitatively.

Participants

I used a convenience sample of volunteer participants ($N = 31$) from a local high school in a medium-sized Midwestern town. Participants had between 4 and 10 years of string instrument experience and were in ninth through twelfth grade. Participants ($N = 31$) included 10 males and 21 females, ages 14 to 18 years ($M = 15.87$, $SD = 1.36$). They were Caucasian ($n=16$), African-American ($n=1$), Asian ($n=8$), Hispanic/Latino ($n=1$), Native American ($n=1$), or of mixed heritage ($n=3$). Instrumentation consisted of violinists ($n=18$), violists ($n=3$), cellists ($n=5$), and double bassists ($n=5$).

The Researcher

Qualitative research assumes that the researcher has an effect upon the subject and context of the study because the researcher cannot separate himself or herself from the topic he or she is studying. The researcher therefore brings biases to the research, and must accept that having a purely objective point of view is impossible (Creswell, 2011). In designing and conducting this study, my biases are that I am an orchestra teacher and a violinist. When I taught in public schools, I used memorization in my classes extensively, and I also require my private violin students to memorize music for performances. I believe that memorization is beneficial to musicians, and I think that practice needs to be clearly structured in order to be effective for novice players. In this study, I am looking at memorization and practice through a self-regulation lens.

Materials

I selected the second and third violin parts of a round entitled, *Gentle John*, from a collection of rounds and canons (Bergonzi, 2000; see Appendix A, B). The piece was selected because it was likely to be unfamiliar to students, but still within their skill range. I also wanted

the piece to be long enough, so that participants would have enough material to work on during the 10-minute rehearsal session. Two other experts in string education verified the appropriateness of these melodies for the participants, namely the conductor of the high school orchestra and a professor at the local university. The orchestra's conductor had 19 years of experience teaching public school orchestras, and the professor had 10 years of experience teaching strings in public schools and higher education.

Gentle John was written in E minor, which is a comfortable key for string instruments. The melodic content, articulations, and dynamics in the second and third violin part were the same, offering all participants a variety of rhythmic and pitch challenges within the capabilities of an intermediate strings player. To prevent a ceiling effect among more experienced participants, the second violin part was written an octave higher than the third violin part and required shifting.² To address the needs of violists, cellists, and bassists, I transposed the melody to fit the octave range of each instrument and the capabilities of the player. Violas rehearsed the 3rd violin part in the written octave; cellos received the 3rd violin part transposed down one octave from the written score, and basses received the 3rd violin part written down one octave as well. The melody was presented to all participants in written notation in the appropriate instrumental clef, and the difficulty level of the piece was consistent across all instrument types.

Procedure

I randomly assigned participants to the treatment group (memorization) and control (practice) group using an online random sorting tool (Tarr, 2015). I sorted their names onto an ordered list that alternated between the memorization and practice groups. During the data

² Shifting is a performance skill specific to bowed string instruments. During a shift, the entire hand moves up or down into various positions on the fingerboard (Galamian, 2013). The presence of shifting increases the difficulty level of a piece.

collection process, a number and treatment code were assigned to each subject for anonymity (e.g., M1, P2, M3, P4, etc.).

All study procedures were completed at the public high school where the orchestra rehearsed. The recording site comprised one room that was quiet and large enough to accommodate the needs of the study. Participants provided their own instrument and bow; I provided a chair, music stand, metronome, digital timer, audio recorder, video recorder, and sheet music. Upon entering the room, I instructed each participant to sit (i.e., cellists) or stand (i.e., violin, viola, double bass). The orchestra was divided into two violin sections; the first violins contained more advanced players with higher performance ability, and the second violins were less advanced. I asked each violin player which section they were assigned to, and if they were in the first violin section, I placed a second violin melody on the music stand. If they were in the second violin section, I placed a third violin melody on the music stand. All other participants (i.e., viola, cello, bass) performed from the part that best suited their primary instrument. Before beginning the procedure, the melody was turned face down on the music stand so that the participant could not see the notation. The video recorder and digital timer were placed approximately three feet in front of each subject. Once the participant was in place, I briefly turned over the melody and asked if and when the participants had played this melody before today. If participants had played the piece prior to this study, I wrote down where they had played it, dismissed the participant, and discarded their data. I then flipped the music back over so it was not visible to the participant and read the following instructions:

***Practice Group:** On the stand in front of you is a melody. When the experiment begins, flip over the page. You will have 10 minutes to practice the melody using any means you would like. After 10 minutes, I will return to test your progress. During the test, play the*

melody one time to the best of your ability. Once the test is over, I will ask you a few questions. Your practice session, test, and the answers will be recorded using the camera in front of you. Please do not speak during the test. You may speak during the practice session and when I ask you questions. Do you have any questions? Are you ready?

Memorization Group: *On the stand in front of you is a melody. When the experiment begins, flip over the page. You will have 10 minutes to memorize the melody using any means you would like. After 10 minutes, I will return to test your progress. During the test, play the melody one time from memory to the best of your ability. Once the test is over, I will ask you a few questions. Your memorization session, test, and answers will be recorded using the camera in front of you. Please do not speak during the test. You may speak during the memorization session and when I ask you questions. Do you have any questions? Are you ready?*

Upon indicating that they were ready to begin, I turned on the video recorder, started the timer, and instructed participants to turn over the melody on the music stand and begin practicing or memorizing. Immediately afterward, I left the room to avoid any effects that could result from my presence. Participants were then given 10 minutes to rehearse the melody.

At the conclusion of the 10-minute rehearsal period, I re-entered the room. I asked again if and when the participants had played this melody before today to check that students who may not have recognized the title of the piece did not recognize the melody after they began rehearsing. No participants indicated that they had played the melody before. I then asked the participant to play the melody once.

After the student had completed their performance of the melody, I stopped the recording devices. I then collected demographic information on age, grade level, ethnicity, and school

attended from participants verbally and recorded it in a Microsoft Excel document organized by participant identifier (e.g., P1, M1, etc). Once complete, I moved on to the second phase of the procedure: a structured interview. To decrease the chance of biased responses, I read participants the following statement:

Now we will begin your interview. Your responses to my questions will not influence my judgment of you in any way. You must answer these questions truthfully. Your teachers, friends, and parents will not see or hear any of your answers or your rehearsal video. Are you ready to begin?

If the participant answered “no,” I dismissed them from the study room and discarded their data. If the participant answered affirmatively, I re-started the recording devices and asked the following three questions:

1) When I say the word practice/memorization, what does that mean to you?

Objective: To determine how students define memorization or practice, depending on the group to which they were assigned. I wanted to see if the student’s goals for rehearsal matched with what they perceived the task to be. I needed to know what they thought they were supposed to do so that I could look at goal specificity.

2) When I gave you instructions to practice/memorize this piece, what did you think about doing? (Follow-ups: What plan, if any, did you have before you started practicing/memorizing? How did you go about that?)

Objective: To determine student goals for the rehearsal session. This helped answer the research question: What is the effect of directions (i.e., to practice or to memorize) on levels of specificity in self-reported student goals for individual practice?

3) *We just talked about how you planned your rehearsal. Now let's talk about what you actually did during your memorization/practice session. Talk to me about how you memorized/practiced the piece. (Follow-ups: What strategy, if any, did you have in mind? If you were going to teach me what you just did, how would you describe it?)*

Objective: To determine rehearsal strategies used by the student. This answered the research question: What is the effect of directions (i.e., to practice or to memorize) on self-reported student use of rehearsal strategies during individual rehearsal?

I piloted the interview questions using a cognitive interview process with four high school string players (Beatty & Willis, 2007). Using their feedback, I then adjusted the wording in the interview questions and added follow-up questions to the interview in order to clarify participants' responses.

At the conclusion of the interview, I dismissed the participant from the room. The rehearsal and interview together lasted approximately 25-30 minutes per participant.

Data Analysis

I watched each participant's rehearsal and interview videos and transcribed the interview using the online software, *Transcribe* (Transcribe, n.d.). To complete a transcript debriefing of each transcription, I then met with the participants a second time at the orchestra's rehearsal, provided each one with a copy of their transcript, and had the participants read their transcripts to make sure I accurately represented what they said and did. If any changes needed to be made, the participants were instructed to write in their changes on the interview transcript.

After performing the transcript debriefings, I identified and listed the goal statements from each participant's transcript. Goal statements consisted of a sentence to a paragraph of the

participant's own words that described an objective that they worked on or intended to work on during rehearsal. To test the reliability of my identification of participant goals, an external evaluator read the transcript for every interview. The evaluator was instructed to identify and highlight each goal in the transcript as they read it. I then compared the evaluator's identified goal statements with my own to check for intercoder reliability, using Krippendorff's alpha. Krippendorff's alpha was chosen as the measure of inter-rater agreement because it is "arguably the most general agreement measure with appropriate reliability interpretations in content analysis" (Krippendorff, 2013, p. 278). Krippendorff's alpha can (a) be used by two raters with dichotomous, nominal data, (b) is applicable to both small and large data sets by correcting itself for varying amounts of reliability data, and (c) can handle missing values caused by an observer not attending to recording all units (Krippendorff, 2013).

Krippendorff's alpha ($c\alpha$) was calculated using the KALPHA Macro (Hayes & Krippendorff, 2007) in SPSS Statistics, Version 24 (IBM, 2016). Reliability of the participant goal statements was deemed acceptable by Krippendorff's standards: $\alpha_{(2, 248)} = .81$; 95% CI [.679, .920]; $q_{(.80)} = .483$.³

Once the goal checklists were deemed reliable, I enlisted help from three other music education researchers to evaluate the specificity of participants' goal statements. Each evaluator was provided with a 5-point Likert-type scale assessment tool that I created using Google Forms (see Appendix C). The scale ranged from 1- no specificity to 5- highly specific. Previous research has presented goal specificity as a dichotomous variable; either the goal is specific or it is not (Wood, Mento, & Locke, 1987). In my study, I sought to present a more detailed

³ $\alpha_{(\# \text{ of coders, } \# \text{ of items coded})}$; $q_{(\alpha_{\min})}$ = probability of failure to achieve an alpha of at least α_{\min} (Krippendorff, 2013, p. 321)

assessment of goal specificity. I trained each evaluator to assess the specificity of student goals by presenting them with sample goal statements. We talked through the goal statements and identified key components within each statement, such as the objective and process. I provided examples of clear and vague objectives, as well as specific and non-specific processes. Then we discussed how each sample statement would be rated on the Likert-type scale I created.

After each evaluator was trained, I presented them with participants' goal checklists. The evaluators rated the goals for each student using my goal specificity Likert-type scale.

Coefficient alpha (α) between evaluators was .946, indicating a high degree of reliability between evaluators. For each participant, I calculated both the mean and median goal specificity for each goal statement ranked by the evaluators. I averaged the means together to create a single mean goal specificity score for the participant. I also took the median of all the median scores from each participant to create a single median goal specificity score for the participant. I performed a Mann-Whitney U to determine if a significant difference between the goal specificity of practicers and memorizers existed.⁴

Qualitative Analysis

After completing the quantitative portion of the study, I went back to the interview transcripts of each participant and coded the goals using a first and second cycle coding procedure. I used MaxQDA12, a qualitative data analysis software program, to code and sort data (MaxQDA, 2016). This software allowed me to organize my data, search within it for codes, and look at what codes overlapped, frequently occurred alongside code, or which codes seemed

⁴ Although this study involves ordinal data, I also performed a one tailed *t*-test because at sample sizes greater than 20 participants, the data begins to resemble a normal distribution. Because of this, it is possible to use a *t*-test as opposed to a Mann-Whitney U. (Hinkle, Wiersma, & Jurs, 2003).

to occur only within a specific group of participants. In the first cycle procedure, I used open coding to code the transcripts. Corbin and Strauss (2008) define open coding as “breaking data apart and delineating concepts to stand for blocks of raw data [while at] the same time... qualifying those concepts in terms of their properties and dimensions” (p. 195). More specifically, I used a mixture of descriptive, process, and in vivo codes in this procedure. Descriptive coding refers to summarizing data in a word or short phrase; process coding uses gerunds to describe actions in the data; and in vivo coding involves assigning a label to data using a word or short phrase taken from that section of the data (Miles, Huberman, & Saldaña, 2014).

Once the first-cycle coding was complete, I used pattern coding for my second cycle procedure. Pattern codes are “explanatory or inferential codes, ones that identify an emergent theme, configuration, or explanation. They pull together a lot of material into a more meaningful and parsimonious unit of analysis” (Miles & Huberman, 1994, p. 69). Pattern coding is helpful for developing major themes from the data, searching for causes or explanation in the data, and forming theoretical constructs and processes (Saldaña, 2009).

After completing the second-cycle coding, I grouped these codes into broader themes. Themes are “extended phrases or sentences that summarize the manifest (apparent) and latent (underlying) meanings of data” (Saldaña, Leavy, & Beretvas, 2011, p. 108).

As qualitative research is interpretative, I sought a second opinion to verify the data and interpretation of themes (Compton, Campbell, & Mergler, 2014; Creswell, 2011). A second music education researcher analyzed 20% of the transcripts (3 from each group) using a copy of my codebook. Both sets of interviews were compared and differences in interpretation of the

codes were discussed until a consensus was reached. Themes were only accepted when both researchers felt that there was sufficient data to warrant their inclusion.

Chapter 4

RESULTS

The purpose of this study was to compare differences between self-reported goals of high school orchestra students when given directions to either practice or memorize music during a 10-minute rehearsal. The results have been organized based on the research questions:

1) What is the effect of directions (i.e., to practice or to memorize) on levels of specificity in self-reported student goals for individual rehearsal? 2) How do directions to practice or to memorize impact self-reported student use of rehearsal strategies during individual rehearsal?

The Effect of Directions on Levels of Goal Specificity

I collected the mean and median goal specificity scores of participants by group (see Table 1). I chose to use the Mann-Whitney U, a test of significance, as the appropriate statistical test for this study because it is nonparametric and my study involves two samples and ordinal data (Hinkle, Wiersma, & Jurs, 2003). Although the Mann-Whitney U does not demand homogeneity of variance (Hinkle, Wiersma, & Jurs, 2003), I ran Levene's test of homogeneity to determine if there was equal variance between the groups because interpretation of differences between the groups becomes difficult when variances are not equal (Hart, 2001). The assumption of homogeneity of variance was met using Levene's test, $F_{(29)} = .047$, $\alpha = .829$.

Results of the Mann-Whitney U indicated that the specificity of goal statements was not significantly different between practicers (Mdn = 3) and memorizers (Mdn = 3), $U = 119$, $p = .966$. Because the observed value of U is greater than the critical value (70), the null hypothesis could not be rejected. Practicers and memorizers created goals with similar levels of specificity. For examples of student goal statements and their ratings, see Appendix F.

Table 4.1

Analysis of Composite Goal Specificity Scores by Group

Participant	Memorization		Participant	Practice	
	<i>Mdn. (IQR)</i>	<i>Mean (SD)</i>		<i>Mdn. (IQR)</i>	<i>Mean (SD)</i>
M1	3 (2)	2.82 (1.10)	P1	3 (2)	2.83 (1)
M2	2 (2)	2.08 (1.01)	P2	3 (2)	2.79 (1.14)
M3	2 (2)	2.58 (0.58)	P3	2.5 (1.5)	2.83 (0.66)
M4	3 (1)	3.28 (0.67)	P4	1 (2.5)	2.15 (1.51)
M5	3.5 (1)	3.42 (0.91)	P5	3 (0.75)	2.88 (0.63)
M6	2.25 (2)	2.22 (1.07)	P6	3 (3)	3.42 (1.05)
M7	4 (2)	3.38 (1.47)	P7	2 (2.25)	2.33 (1.30)
M8	3 (0.5)	3.33 (0.52)	P8	3 (1)	3.25 (0.65)
M9	3 (1.75)	2.85 (0.95)	P9	3 (2)	3.00 (1.21)
M10	3 (3)	3.09 (1.57)	P10	3 (1.5)	3.05 (0.96)
M11	3 (1)	3.25 (0.87)	P11	2 (2)	2.05 (1.07)
M12	4 (3)	2.97 (1.48)	P12	3 (1)	3.38 (1.05)
M13	2 (2)	2.05 (0.86)	P13	4 (2)	3.92 (1.01)
M14	3 (1.5)	3.04 (1.08)	P14	4 (0.5)	4.05 (0.51)

M15	2.5 (2)	2.95 (1.22)	P15	4 (1)	3.48 (0.62)
M16	4 (1)	3.7 (0.82)			

Student Rehearsal Strategy Use

Through the interview and coding processes, six key themes emerged that describe students' self-reported conceptualizations of memorization and memorization strategies. In the practice group, three key themes emerged that describe students' self-reported conceptualizations of practice and practice strategies. In addition, three key themes emerged that describe rehearsal strategies used by both memorizers and practicers. To protect participants' identities, I have chosen to use participant group identifiers (i.e., P for practice, M for memorization) and pseudonyms to represent the students.

Memorization and Practice Shared Themes

All participants in this study shared certain characteristics in their rehearsal that defined how they worked. Most notably, all learners used frequent repetition during rehearsal in order to achieve their rehearsal goals. Both memorizers and practicers felt that it was important to repeat passages in order to learn them satisfactorily. Participants from both groups also had a clear sequence to their goals, although the order of the sequence varied from person to person. Some learners planned to start by observing written symbols on the page (i.e., time signature, key signature, and tempo markings), while others chose to learn the rhythm or notes first. Most learners agreed that expressive elements (i.e., dynamic markings, crescendos and decrescendos, and articulations) were secondary in importance. Both memorizers and practicers also identified the importance of focus and concentration during rehearsal. Participants from both groups recognized the value of being attentive and linked it to more successful rehearsal outcomes.

Table 4.2

Memorization and Practice Shared Code Frequencies

Theme Code	Memorizer Frequency ^a	Practicer Frequency ^b
Learners employ frequent repetition	100%	100%
Learners sequence their goals		
Symbols on page first	31.25%	53.33%
Rhythm first	25%	46.66%
Notes first	12.5%	6.66%
Expression secondary	31.25%	53.33%
Learners value concentration/focus in rehearsal	25%	33.33%

^{ab}*Note.* Percent of participants within each directive group (i.e., memorization or practice) who stated the listed code.

Learners employ frequent repetition. Both memorizers and practicers used repetition as their main rehearsal strategy. In fact, every participant described using repetition in rehearsal. Maddie (M) sums it up nicely: “Repetition is definitely something that I incorporate every time.” Participants explained that their goal with repetition was to do something until they remembered what to do and it sounded good consistently. Sarah (M) describes it as “practicing something over and over until it sticks in your head,” while Julie (P) says “I’d repeat playing over and over

the measures, so I remember it.” Repetition for Evan (P) involved “running it again and again until I get it right,” and Macy (P) played it “over and over again, checking to make sure I was in tune and stuff.” Alexis (M) explained why repetition is useful for memorizing music: “It’s really just repetition. That’s how you memorize things. It’s just hearing it over and over again, or doing it over and over again, you start to just get it down... Our instructors always talk about being repetitive so that we can get things down, and that’s what I do with music when I need to get my fingerings down.”

Some participants focused their repetition on difficult passages, like Rachel (M): “I just played it over and over and tried the tough parts over and over... I usually just play the piece over and over in little different sections.” Sophia (P) also tried repetition for difficult spots: “If something tripped me up, then I would go over it maybe two times,” as did Brandon (P): “I repeated [measures 9-12] I guess five times.” Several practicers defaulted to repetition when they didn’t know what else to do, as Anna (P) explains: “But I just kept trying; I didn’t, I couldn’t think of any other method... that’s just what I usually do.”

Overall, participants found repetition to be tedious, but necessary. David (P) describes working on a passage in the piece: “Work on that until it’s just so repetitive it’s annoying, but then I get better at it. And then I’d probably go to the same spots, the same five or six measures... Grind on that until they were annoyed with it.” Abigail (P) also found repetition to be boring: “I think I play the same piece maybe 20 times. Just like, I’ll go through everything, do my repetition, then I’ll just play it over and over again until I get really bored. And then I’m like, ‘Okay, that’s enough.’”

Learners sequence their goals. Most participants had ideas about what they wanted to work on first and what was less important to them. Participants tended to start by focusing on either rhythm, pitch, or the symbols on the page (i.e., time signature, key signature, tempo, etc.). Starting with the symbols on the page was the most common beginning. Jordan (P) explained why he started this way: “[I’d] figure out a good tempo to work on, and then obviously look at the key signature and stuff so I’m not playing wrong notes the entire time.” Haley (M) also began with this approach, stating: “[I’ll get] all the correct accidentals and all that, and yeah. Just making sure I had the basic stuff down before I just tried to memorize it.” Nathan (M) pointed out that in order to figure out “how to actually play it, I had to look at the time signature and key signature.”

Some participants began by figuring out the rhythms first. Many participants in this category were guided by their orchestra director, Mr. S, who often tells the students that, when sight-reading music, they need to start with rhythm. Allison (M) explains: “I know that Mr. S says to do the rhythm first.” Tracy (M) also began with rhythm: “The first thing I thought was, ‘Okay, how am I going to count this off?’ So I was struggling with that for a solid minute or two. I was like, ‘What’s my tempo? What’s going on?’ So that took me a while. I think that’s basically my main struggle... So in the first two or three minutes I focused on tempo and rhythm and counting myself off properly.”

A few participants chose not to begin with rhythm or symbols, but went for notes first. Mark (P) describes this: “I first practice the notes, what they sound like, make sure that they’re in tune and on beat. That’s what I try to go for when I practice.” Allison (M) decided to start with pitch as well. “If I don’t get the notes first then I’ll never get the notes. If I have to get the notes first before I can get the rhythm... because rhythm for me is really easy. It’s just... I’d like to

think I'm pretty good at sight reading, but I have to get the notes first or I'll never get them. I'll just skip over it."

The idea of adding expressive elements after pitch and rhythm are established was very common among study participants. Participants prioritized what was important to them in the piece, and usually "getting the notes" trumped expression. Emma (M) describes her rehearsal: "It was just like, memorize as much as you could. So I wasn't concerned with expressing or bow or anything... I think at the beginning you want to get the correct notes and your fingers in the right spot, and then afterward you can go back and work on... dynamics and expression." Evan (P) also focused on the melody when first learning the piece: "Sometimes I'll leave out some spots like, I'll leave out the tie or the crescendo if I'm practicing it for the very first time. Or I'll skip an up bow or... and then I'll add those in later." Julie (P) explains that "I wouldn't really worry about dynamics, just so that's not another level to think about."

Both Jordan (P) and Tracy (M) recognized that expressive elements are important for the piece, but they each made a conscious decision to leave them out during their 10-minute rehearsal. Jordan (P) shares his thoughts: "I would probably add dynamics in, personally I would want to do that once I could actually play through the piece because I'd want to be comfortable with it. So then I could add the extra stuff in there. Because then I know, thinking about dynamics is more difficult when I'm focusing so much on making sure I have the notes and the rhythms right, and it kinda [*sic*] throws me off to try to think about that stuff at the same time. Because then... there's so much going on that I have to think about." He also reflects later on: "It's kind of like... if you have a grace note or something, you want to make sure that you can do the whole base of the piece before you add that stuff in. But you definitely want to have that stuff in there to give it the shape of the piece. But at first at least, it would be more like bow and I

would get that in there. But dynamics at least I would be like, ‘We’ve just got to get the rhythms and notes and stuff down first.’” Tracy (M) reached a similar conclusion: “I didn’t quite get to that point [expressive elements], but I did recognize that there are certain things that I would need to get to eventually were I to actually memorize this. For example, the 8th note in the first measure has the tenuto mark, so I was like, ‘Alright, once I get this memorized I will make sure that one’s longer.’ But yeah... I didn’t necessarily do it.”

Learners value concentration and focus in rehearsal. Several participants from both groups stressed the importance of being focused during rehearsal in order to be successful. Allison (M) described how, if she focused, she could memorize better: “I can usually, if I really, really think about it for like... if I’ve only played it three times, if I think about it for a little bit I can get it.” Alexis (M) emphasized that focus was important: “[I’d] make sure I was paying attention to what I was playing... I feel like, when you’re first doing it, you need to be focused... have your mind just on that one thing. Macy (P) felt focus, concentration, and motivation all work together to make you better at what you’re doing: “Focus and concentration are extremely important. Because it all ties together, especially with motivation. If you’re going to be focused and concentrated then you’re going to be motivating yourself to say that to yourself every time you wanna [*sic*] just check your phone or something, or go get a seat on the bench while everyone’s playing. Like, no, I’m trying to get better. I need to concentrate on what I’m doing. Or don’t worry about this person who’s better, this person who should be doing better; just worry about yourself, and you’ll make the team better or you’ll make the orchestra sound better. Work on your specific stuff.” Maddie (P) has found that focusing during music practice has helped her in school as well: “I think that with discipline from years of music, I’m probably more prepared to sit down and focus on practicing homework problems.”

Memorization Themes

In addition to the themes shared with practicers, memorizers in this study presented several habits and characteristics that were exclusive to the memorization group. They describe memorization through a few key characteristics, such as muscle memory, remembering fingerings, and feeling and knowing the music without looking at it. They also are able to draw connections between musical memorization and other areas where they use memorization, specifically academics. Memorizers tend to focus on broader goals in rehearsal and pay attention to how sections within the music fit together. Memorizers display frequent self-evaluative strategies, such as glancing, and playing without the music. Additionally, memorizers create mental representations of the music by listening to how it sounds via live performance or recording, hearing it in their head and comparing their performance, and visualizing the sheet music. Memorizers were able to articulate clear plans and strategies for the memorization process that they were able to apply to their rehearsal. Memorization also had specific costs to the participants that were not displayed in the practice group, such as feeling constrained by the 10-minute time limit, limiting themselves to the first half of the piece, and general performance anxiety.

Table 4.3

Memorization Code Frequencies

Theme	Frequency ^a
Code	

Memorizers focus on broad goals

Segmentation as a means of memorizing the whole	81.25%
Linking sections/putting parts together	68.75%
Amount of piece to learn	81.25%
Memorization as feeling and knowing without looking	
Definitions of memorization ⁵	81.25%
Relationship to academics	37.5%
Muscle memory	37.5%
Remember fingerings	31.25%
Costs to memorizing	
Time constraints	68.75%
Stuck to first half of piece	68.75%
Performance anxiety	25%
How memorizers self-evaluate	
Testing without written score ⁶	62.5%
Glancing	37.5%

⁵ Codes included feeling the music, general remembering, “engraving in your mind,” playing without forgetting, knowing without looking, playing without thinking, playing by ear, and doing without help.

⁶ Codes included closing eyes, testing without music, turning the stand around, and flipping the music over.

Memorizers employ an organized plan/system **43.75%**

Memorizers create a mental representation of the music

Listen to how it sounds	31.25%
Hear in head and compare	31.25%
Listen to recording	18.75%
Visualize sheet music	18.75%

^a*Note.* Percent of participants within the memorization who stated the listed code.

Memorization as feeling and knowing without looking. When asked to define memorization, participants generally described a process of playing music or performing an activity without help. This was broken down into two different aspects: feeling the music on a visceral or emotional level, and knowing the music technically.

Allison described a sense of flow that she only achieves when she has memorized music, saying that “I’ve noticed that when I memorize stuff it just sort of flows out. Like, I don’t even think about what I’m about to do, my brain just does it.” She further elaborated that “for me it’s when I feel the music. When I really feel it.” Other participants agreed that connecting with the music emotionally helped them memorize. Rachel spoke to this point: “When you have the feel for it, it’s easier to memorize... I guess when you get the feeling, the mood that the piece gives off.”

Some participants focused their definitions on the technical requirements of memorization. Nathan explained that for him, memorization is “being able to play the piece

without looking at it obviously, and doing all of the things that the music would normally tell you to. So like, knowing everything about the music.” Similarly, Chelsea states that memorizers “play a piece and they don’t have any music in front of them. And they have to take everything from memory, all the notes, but also like, all the dynamics and everything.” Participants who focused on technical aspects also tended to include the absence of music or assistance as a key requirement of memorization. Tracy explains: “[I] just commit to memory, in other words, figure it out so I don’t need to have anything prompting me, just kind of knowing what I’m doing... without the use of any extra resources.” Bobby describes it as “learning the piece, at least the notes and the rhythms, and like, being able to play it without looking at the paper.” A few participants also discussed the permanent nature of memorization, or the ability to go back to a piece after a break and still remember it. Kale describes this process as “engraving something in your mind,” which emphasizes its permanence.

In addition to defining memorization, participants often described a relationship between musical memorization and memorization in academics. Many participants saw crossover between these two areas and were able to identify similarities between memorization in music and academics. Alexis discussed similarities between how she memorizes for history and music: “Playing it over and over again you get to hear it and your fingers get to get the feeling of it. And then say history, you read it over and over again to yourself and you get those words in your head... so just repetitive for memorizing.” Tracy explained how she used memorization in theatre and mathematics. She noted that she likes to have the whole piece of music learned before memorizing it, and compared that to academics: “I think in order for memorization to be effective, you need to kind of already know what you’re doing with it. It’s the same with formulas and lines; if you don’t know how to use a formula, you’re not going to know how to

implement it even if it's memorized." Emma also related musical memorization to mathematics. When asked what she memorizes, she said: "Formulas for math and science. With both of them [music and academics], I'll do the thing that I'm trying to memorize a lot. Like, if it's a formula, write it out a bunch of times." One participant, Haley, found a strong relationship between memorizing Bible verses for church and memorizing lines of music: "I memorize Bible verses for my church, so I go through when I read all of it, then I re-read it and read it, read it, until I just memorize it in my head... I think I kinda [*sic*] approached this [music] the same way because I did the first two lines and then I went back and worked on the first line and then worked on the second line and then did it all together and tried to memorize it like that... Then I just kinda [*sic*] did the same thing I do when I'm memorizing verses again."

While academics may relate to the cognitive side of memorization, several participants also elaborated on the physical aspects of memorization, namely, the idea of muscle memory. Alexis noted that for her, "It's more like muscle memory... even playing the instrument. I more think of my fingers memorizing where to be than me actually remembering the notes." She later mentioned that it feels like "your body just takes over" when something is truly memorized. Kale agreed. For him, an important aspect of memorization is "muscle movement. Like, getting that into your memory, which is a lot different. So it's not just a brain thing; it's a physical thing as well. Physical plus brain." Chelsea describes muscle memory as "it's kind of like, if you don't know that you're really playing it and you don't know what you're doing at some point, but then your fingers just kind of do it anyway... As long as I get started, I'll be able to keep going." Emma explains that she repeats passages over and over with the goal of obtaining secure muscle memory: "Repeating passages and trying to get your hand muscles used to the way that they're doing, so you're not just recalling notes. You have the... your muscles just know where to go."

Some memorizers combine the cognitive and physical aspects of memorization through remembering fingerings. Nathan thought about “where my fingers are... combining visually envisioning [the music] and feeling what comes next in my hand.” Tracy theorized that the numerical precision of fingerings might be helpful when memorizing: “Whenever I see people memorizing music, they’ll look at it and then they’ll look at their fingers when they’re actually doing it from memory. Which I guess that seems to help the numerical value to it, the 1, 2, 3. You can just [think] ‘What finger are you using?’” Both Emma and Sarah used the strategy that Tracy discussed. Sarah pointed out that, “it’s easier if I look at my fingers,” while Emma said “I just watch my fingers instead of looking at the music.”

Memorizers focus on broad goals. Although the goals that memorizers set for themselves were not more or less specific than the goals of practicers, memorizers’ goals were focused on creating a holistic portrait of the music rather than cleaning up difficult sections or technical work in the piece. Both memorizers and practicers used a segmental approach in rehearsal by breaking the piece into sections, but memorizers did so with the intention of putting the pieces back together again almost immediately. Haley explains her strategy: “I did the first two lines and then I went back and worked on the first line and then worked on the second line. And then did it all together and tried to memorize it like that. And then I did the third and fourth lines.” Describing her strategy later on, Haley elaborated: “And then I’d go back and practice lines one, two, three, and four together. And then I would play it all together. And then what I missed I would go back and fix it and work on it like that. That way it’s like, slowly getting connected.” Rachel used the exact same strategy, describing that “as you memorize one section you play it, and then the next section you memorize it. And you play the first section and the next section.” Alexis employed a similar approach: “I broke it into lines mostly, and then I tried

to play it all together.” Amanda described why she chose to segment the piece as, “[I] work on the sections individually and then put them together so it’s a bigger piece.”

Even though the memorizers segmented the piece, they only did so to create a manageable amount to memorize, with the intention of immediately combining sections into the whole once memorized. Sarah explained her reasoning for segmenting the piece as “when things are breaking down to smaller pieces, I have an easier time remembering where my hands are supposed to go.” Claire agreed that smaller pieces are more manageable: “I don’t try to do everything at the same time because it’s, I know it’s not possible. And even if I do it, it’s not going to be perfect.”

By breaking the piece into sections, memorizers were attempting to set realistic goals for what they could do within the given 10-minute timeframe. The goals that memorizers set for their rehearsal focused around the amount of the piece they aspired to learn by the end of the rehearsal period. Many memorizers decided that getting the first two lines of the piece was the most realistic goal. Nathan elaborated on why he chose that goal: “I was trying to just do the first two lines because I didn’t think I could do the whole thing anyway... so I thought it would be easier to just try to get a few lines good and not the rest of it.” Bobby worked on the first two lines “because it’s the beginning of the piece and... at least I’d have that to show.” Those memorizers who did not specifically set their goal as the first two lines still defined their goals in terms of the amount of the piece they wanted to learn. Amanda didn’t set a specific measure as her ending point, but explains that “I wanted to just play it as much as I could. I didn’t really care about getting all of it, I just wanted to do the front part because at least [I’m] trying to memorize something. I didn’t even play through all of it.” Claire and Sarah, who had a stronger background in memorization from piano, both set a goal of memorizing the first two phrases, or four lines.

Claire said, “I tried to set my standard down, so I tried to memorize to here [the end of line four]. I didn’t even really look at the last two lines.” When asked about her goals for the piece, Sarah said she wanted to “at least have 2/3rds of it memorized, which was what I did.”

Memorizers employ an organized plan or system. Participants who memorized the piece in this study had clear, organized strategies in place to accomplish their goals. Rachel explains that she did “what I planned to do. I usually try to stick to my plans when I’m memorizing because... it just works. Because I feel like when you’re acting out a plan that you’ve put it place, you perform better.” Haley in particular already had a very detailed system in place for memorization where she would memorize one line, memorize the next line, and then combine them. She would then repeat the process for lines three and four, then add them to lines one and two, working her way through the piece using the same formula. When asked about her memorization process, she shared: “I just came in here and did it how I usually do, which is go line by line and figure out how to do it like that... I followed my system.” Kale detailed his memorization system as: “make an objective, play to it, and just keep drilling it until you get it. And then move on... when you can just play it through memory without looking at it. So kinda [*sic*] doing a smaller version of this assessment with each objective.”

Claire and Emma both described using memorization strategies that had been taught to them in private lessons. Claire used memorization strategies taught to her in piano lessons to help with her memorization on cello: “I practiced separately, like phrase by phrase. That’s how I do [it] in piano, so I just applied the same strategy here.” Emma discussed how she used to memorize music in private Suzuki violin lessons by segmenting the piece: “When I used to do [it] for violin recitals and competitions, I would have different... we would divide up different

passages and I would be like, ‘Okay, I’d have this passage memorized by this date, this passage memorized by that date.’”

One memorizer, Tracy, flustered by having a rehearsal period of only 10 minutes, completely threw out her typical memorization strategy and was frustrated with the result. She described her normal strategy as “I make sure that I know all the rhythms and everything and I know what it sounds like when it’s in tune. And then I’ll start doing it two measures at a time. So I’ll start from the beginning once I’ve got it all down... And then I’ll proceed by adding just one measure each time. So that usually works out. It takes me quite a long time, but you gotta [*sic*] do what you gotta do.” When asked why she didn’t use her normal system during her rehearsal for this study, she explained: “The thing is, usually just learning the whole piece itself would take me an hour. So trying to do all that in one minute instead was... chaotic for me. I was like, ‘Oh no, I don’t know what I’m going to do now.’ That when I kind of tried to go back to my first approach... but instead of getting it perfect I went for good enough.” She later reflected on her rehearsal: “I think it was just so odd how suddenly as soon as the idea that I only had 10 minutes... it just completely messed with me and then I basically changed everything about my technique.”

Memorizers create a mental representation of the music. Although mentioned less frequently than other themes, one of the critical differences between memorizers and practicers was the desire of memorizers to create a mental picture of how the music should look and sound. They created a mental representation by playing through the piece holistically and visualizing the sheet music. Kale stated that he played the entire piece “just to know what it sounds like... that kind of helps me memorize things.” The very first thing that Claire did was to play through the entire piece. She explains: “First I wanted to see how [*sic*] it sounds like. And I tried to

memorize the melody and what kind of music it is. So like, major, minor, or like, it ends weird.” Similarly, John first had to “memorize how it would sound, like, the notes.” He explains that “sometimes when I play a piece, [if] I haven’t heard it before, I can’t really play through the entire thing without knowing how it sounds.” Live performances by other people can also be beneficial to memorizers. Haley points out that “even in class it’s better because I have everybody else to listen to and my stand partner. And you kind of hear how it fits together, or you hear the other parts, so it just makes a lot more sense and you can get into the rhythm and the mood of the music. It’s more intuitive than it would be just reading it off the page.”

For some memorizers, envisioning the sheet music in their head while they played was beneficial. This visual mental representation of the music helped memorizers like Nathan, who said “I’m a very... when I’m playing it and I’m trying to do it memorized, I think about the notes on the page. Try to visualize what the notes were. I visualize what the music looks like in my mind.” Amanda shared in this opinion: “Visuals are really helpful too. Like, if you can remember what it looks like. [I] really try and remember what it looks like.” John also “picture[s] the melody of the notes” when he memorizes music.

One of the ways that memorizers wished to create an aural representation of the piece, besides playing through it or listening to it live, was to listen to a recording. Several memorizers found recordings to be extremely beneficial when memorizing music. Erica expressed a desire to “find this music online and just listen to it while you go over it.” Claire finds recordings especially helpful when she needs to memorize quickly. “I listen to the recordings a lot. If I have to memorize this piece really fast, I listen to the music 24/7, I try to.” When asked why she thinks it’s helpful to listen to recordings of a piece, she points out that “It helps me to think more musically, like how the music sounds like. And then, I don’t think I do exactly the same as a

recording... [I listen] just to see how it sounds like.” Kale also likes listening to recordings before he learns a piece, stating that they help him “get a sense of what the song sounds like.” He explains: “Sometimes when you look at a piece of music, like when I did, I was like, ‘Okay, dotted quarter note.’ But then I was like, ‘That’s kind of... speed, tempo, that’s really subjective.’ So you’re not really sure how long you want to hold it. And if you hear a recording of someone else doing it then you can kind of go off that.”

For some memorizers, once they had created an aural mental representation, they would hear the piece in their head and compare their performance to the mental representation. John notes you can “compare what yours sounds like with how you know it’s supposed to sound.” Haley had a similar experience: “I just kind of heard it in my head. Like, I played through the first two lines and I knew that’s what it was supposed to sound like, and so when I went back to do it again, I knew what it was supposed to sound like and it was already in my head.” Bobby took a very strategic approach: before playing at all, he “tried to imagine hearing it, what it would sound like from just looking at it.” Then he used his mental recording to evaluate his performance. Nathan also created a mental image before playing: “At first I thought how to actually play it... then just think about how it sounds.” Later, he elaborates on the benefits of hearing the piece and creating a mental representation for comparison, stating, “I think it would help to listen to it a bunch if they could, or have someone play it for them. Because I think that once you know how to play cello, or any instrument, at a certain level, you can... if you know how it sounds you can probably figure out the fingering somewhat, even if it’s not the right thing. I would just... think about how it sounds as a whole and try to connect [the parts].”

How memorizers self-evaluate. Memorizers use the feedback from their rehearsal to self-evaluate. In general, self-evaluation strategies can be divided into two categories: testing

without the written score, and glancing. To test without the written score, memorizers would close their eyes, turn the stand around, flip the music over, or avert their eyes. When asked how he checked if the music was memorized, Nathan said he “closed my eyes and just played through it without looking.” Responding to the same question, Amy “actually turn[ed] the stand around or tr[ie]d looking away from the music.” The majority of memorizers who tested without the written score physically flipped the music over. Amy described her primary strategy as: “play the piece looking at it a few times, and then I try turning it around and play whatever I’ve memorized to the best of my ability.” Her intention in flipping the music over was to get an honest assessment of “what all I have memorized” and “see what I can do.” Alexis also flipped the music over to assess her memorization progress. When she encounters a difficult phrase: “What I usually do for memorizing is just play it over and over again and then flip it around and see if I can get that spot.” To evaluate whether or not she had the whole piece memorized, Alexis said: “I’d play it and then make sure I was paying attention to what I was playing, and turn [it] around if I got stuck.” Rather than physically flipping the music over, other memorizers just averted their eyes from the music to self-evaluate. Kale chose to memorize the piece phrase by phrase. After repeating a line over and over, he would look away from the music and play the line. He described the process: “And then when I stopped, I kinda [*sic*] double-checked myself to see where I got, if I actually played it right without looking. And then I kinda [*sic*] looked at everything.” Rachel worked towards memorizing using a combination of averting and shutting her eyes. She knew she had a line memorized “when I could play it without the music. Or I would shut my eyes and try to play it.”

In addition to testing without the written score, several memorizers self-evaluated using a strategy called glancing. Glancing involves looking at the score for brief intervals of time while

playing in order to check what comes next. Amanda describes how she used glancing to assess what she had memorized: “When I tried to [memorize] just now, I looked at it first and then I started playing it. And then I would try and get as far as possible looking away. Or I would look at it for a second for the note and then look away or something just so I could really feel what it’s like.” She further elaborated on glancing: “I would look back really quickly then look away and then do that just a bunch. And then eventually try and play it all without looking at all.” Haley moved her music to the corner of her stand so that she could look away and only glance down when needed: “I started with the first line and I moved my paper over so I could look off in the corner... and didn’t look at it. And then I went back and checked it. I did that a couple times. I just kinda [*sic*] moved it off to the side and was like this (turns head away and back, away and back). And then when I got done playing it, I looked back and I was like, ‘Okay, well I know I missed that.’” Erica also used glancing, except that she chose to look at her left hand fingers when she was not looking at the written score, while most glancers look off in a corner or off to the side. She describes her process: “I just kept on going through it and once I thought I had it, I would just look at my fingers. Parts of it I turned this way (looks at left hand) so I couldn’t see it.”

Costs to memorizing. Memorization carries with it some unique costs that practicers do not experience. Memorizers in this study voiced concerns about performance anxiety and expressed frustration and panic over the 10-minute time constraint, which led them to limiting themselves to learning the first half of the piece. About half of the memorizers experienced some form of performance anxiety in this study, even though they were not giving a formal performance or being evaluated on their final play-through of the piece. Several memorizers bemoaned the fact that they had a portion of the piece memorized, and then as soon as I entered

the room, it disappeared. Rachel speaks to this point: “I had it memorized before you came in, and then you came in and my brain just like, bloop! Because of the pressure... My brain was scrambling and I was kind of panicking and I was like, ‘What do I play?’ So I don’t know. I just felt kind of uncomfortable during it because of all the pressure.” She explains why she thinks her brain blanked out as: “If I’d had enough time, probably, maybe, I probably could’ve memorized it and not been under pressure. But the pressure with the time limit, and then the pressure of wanting to do it right, just kind of erased my mind.”

Other memorizers attempted to counteract the potential fear of forgetting the piece by rehearsing the beginning extra times. Chelsea confirms this, stating “I practiced the first part extra because I didn’t want to just forget all of it. Because that happens sometimes and I don’t know where to start... I focused on the first note and then the first three notes, just so that I don’t forget the first part.” Alexis followed a similar approach. She was worried about forgetting the beginning if she learned too much of the piece, so instead she chose to “work my way from the top memorizing pieces that I can and not worry about the bottom of it because it will be overwhelming and then I won’t memorize any of it. So just starting from the top and not worrying about how long it was.” Tracy’s performance anxiety was frustrating to her because it caused her to change her normal performance standards. She reflects on this: “I don’t know. Maybe it’s just the fact that there’s more notes. My brain gets overwhelmed and it’s like, it can’t focus on making all four measures good. Rather, it’s just more like, ‘Okay, just get it down.’ And that’s not the kind of mentality I want to have when I’m actually playing music.”

Nearly all the memorizers mentioned time constraints as a reason why they chose to limit themselves to learning a particular portion of the piece. Kale chose to limit himself to the first two lines of the piece. He describes his decision-making process: “I didn’t really think about

looking at the bottom half because I just knew skill-wise I wouldn't be able to memorize the whole thing, so I just looked at what I did." After reaching the end of line two, he reflected that, "Okay, I can't go any further. So then I went to the beginning and I just tried to memorize what I could." When asked how he knew he wouldn't be able to do any more after getting to the end of line two, he said, "Because even when I'm looking at the music, I'm struggling a lot to play it. I don't think without the music I can actually get there." John reached the same decision as Kale, but only after attempting to go on to the third line. "I tried the third and fourth [lines], but that was too much to memorize in 10 minutes. I tried to [do a little of the third line], but... I would, I played the first two, and then I tried to move on to the next one, but then when I was trying to move on, I forgot how the first ones sounded. So I had to go back and play those again." He chose to go back and work on the first two lines because "I felt like that was the limit where I can memorize it, unless I had more time where I could just keep going." Nathan had a similar problem as John: when he tried to memorize more than the first two lines, he started getting mixed up with the beginning. Nathan describes why he chose to only work on the first two lines: "Well I only had 10 minutes so I thought that I just... the two, the next parts are kind of similar to the other ones, but not the same. So I feel like if I tried to learn those, I might mix them up with the first two and mess up the whole thing if I tried to focus on doing all of it. So I thought it would be easier to just try and get a few lines good and not the rest of it."

Both Tracy and Claire shared that they would have done things differently had the time constraint not been a factor. Claire points out that "if I had more time, I would probably have done a lot of things, but with the amount of time I had... [with more time] I would've repeated again and again until I'm sure that I've got this down. But instead, even if I missed something when I was looking at the wall, [I said] 'Okay, let's just move on.' And then I did the other

phrase, which I probably should have not done it because it wasn't 100% correct. But if I had more time, I would've repeated more and more and with the different phrases." Tracy voiced the most concerns and distress over the time constraint. She explained that at the beginning, she spent a lot of time working on the first rhythm patterns and did not monitor her time. She reflects: "Then I realized, 'wow, I just wasted a lot of time trying to figure that out.' I would've been really memorizing." In addition, she has a typical memorization strategy that requires much more time to work properly. Not being able to use her normal strategy was distressing for her: "I spend, of course, more than 10 minutes; I spend about 10 minutes on a section itself, so I guess the way I practice kind of came into my mind when I was playing this piece, and that, with the time constraint, it didn't work out the way I wanted it to." Regarding her normal strategy, she says "I tried to see if I could change it up and make it work in relation to the study itself, but it didn't work."

Some memorizers shared advice with me that they would give to other participants. Amanda pointed out: "I would probably just tell you the sections thing. Try and get at least some of one part; don't worry about trying to play through all of it if you're trying to memorize. Only as much as you can because it's not realistic that you're going to memorize it all. So, you know, use your time wisely." Claire's advice was to "choose a realistic goal for the amount of time that you have."

Practice Themes

Practicers in this study displayed characteristics and strategies exclusive to the practice group. These participants defined practice as general actions for improvement that were not necessarily exclusive to music. Practicers often linked musical practice to practice in athletics. Within music, practice was defined by note, rhythm, and performance quality goals. Practicers

were detail-oriented during rehearsal, often focusing on difficult passages. They frequently targeted passages for a specific reason, such as difficult rhythms, shifting, or intonation. Practicers also extolled the benefits of slow practice and working on sections under tempo. Distinctively, practicers consistently employed two strategies, holistic rehearsal and serialistic rehearsal, that were not present in the memorization group.

Table 4.4

Practice Code Frequencies

Theme Code	Frequency ^a
Practice is detail-oriented	
Target difficult spots ⁷	100%
Segmentation to manage difficult sections	86.66%
Difficult rhythm	73.33%
Difficult shifting	46.66%
Difficult pitch/intonation	46.66%
Slow practice	26.66%
Difficult bowing	33.33%

⁷ Codes included assessing mistakes, assessing difficult/unusual items, context for difficult part, and pull difficult sections.

Practice as actions for improvement

Defining practice ⁸	100%
Notes/rhythm/performance quality goals	73.33%
Relationship to athletics	46.66%

Practicers employ serialistic and holistic strategies

Holistic	66.66%
Serialistic	26.66%

^a*Note.* Percent of participants within the practice group who stated the listed code.

Practice as actions for improvement. When asked to define practice, practicers generally described it as repetitious actions for improvement. This process usually involves working on hard spots, making mistakes, and playing sections over and over again. Lacy defined practice as “working on specific things so that you can get better at it... Working at something, sometimes doing something over and over, to improve on whatever you’re working on.” Macy shared a similar definition: “A lot of it is just getting better every day. Working to achieve little goals at practice and stuff.” Amanda emphasized the end result of repetition: “It would be doing something repetitious until perfected... keep doing it until it’s right.” Some participants identified exactly what needs to be repeated in practice. Maddie, for example, said “Practice

⁸ Codes included working towards consistency, working on hard spots, making mistakes, getting used to something, playing what you see, actions for improvement, and repetition until correct.

means working on specific sections that give me trouble, so that I can play them more accurately and so that they're easier for me to play.”

Similar to the relationship memorizers noted between musical memorization and academics, practicers drew connections between musical practice and athletics. When asked about any similarities they saw between their sport and music, practicers consistently mentioned repetition and wanting to be better at something as commonalities. David drew connections between two sports he plays and music: “With sports like swim and tennis, I go out and practice on the weekends or at practice every day after school... In music when there's a certain section you're not great at, you want to practice that until you're good at it. It's the same with sports where if you... like, at tennis, if I struggle with a certain hit or something else, I'll want to work on that until it's just so repetitive it's annoying. But then I get better at it.” Similarly, Macy, who plays soccer, found the same connections in her sport: “In soccer it kinda [*sic*] goes the same way with finding something hard or setting yourself a little mini-goal so that you can do better for the whole thing, like, the whole game or the whole piece. If you find a measure that's hard.”

The goals that practicers set for themselves during rehearsal also tended to center around either improving a certain aspect of the piece, such as notes or rhythms, or a general performance standard they would like to achieve. Craig described his goal as “play it mostly correct... 80%... mostly rhythms. And just trying to get down the rhythm and then move on to correct notes and stuff.” Macy also focused on rhythm: “Somewhat nail the rhythm because that's a big part of playing any song. Like, you can get the notes all you want, but if you can't get the rhythm it's like... yikes.” Lacy, a violinist, chose to focus more on intonation—especially in the parts that shifted—during her rehearsal: “I wanted to be able to play the notes right and stay in 3rd position

when it said to stay in 3rd position, or change back to 1st position. That was my goal, and I pretty much accomplished that.”

Practicers who described more general performance quality goals typically said something like Jordan: “I wanted to be able to play it. Actually, I didn’t want you to come back and me just butcher the entire thing. I was like, ‘I want to actually be able to do this.’” He continued to elaborate on this goal, stating, “I wasn’t doing it with the idea of me performing it perfectly. It was more just like, me being able to play through it with little rhythm mistakes and note mistakes, stuff like that. If anyone, someone who knew the piece, could hear me play it and know what it is, then that means that I did decently.” Abigail gave another take on a general performance goal: “Play it nice enough so that you say it’s slightly good. [That means] clean, sort of right rhythm, right notes. Not sounding trashy.” Anna explained that she wanted “just to play it well,” which to her meant, “follow the key signature and the tempo and the rhythm and the dynamic markings and everything, and the bow lifts and articulation. That would’ve been the goal.” Maddie had a simple goal: “I just wanted to be able to play it.”

Practice is detail-oriented. Practicers rehearsed the piece by targeting difficult spots. They frequently spoke about isolating difficult spots, working on a difficult rhythm, shifting, intonation, or bowing, slow practice, and segmentation with the goal of providing context for a difficult spot.

Melissa started her rehearsal by playing the entire piece. But for her primary rehearsal strategy, she had this to say: “Maybe like, not running through the whole piece but specific sections. Working on specific sections that are hard.” Laurel agreed that it was helpful to isolate spots that were difficult: “There’s certain parts in music that are super hard, and usually if I don’t work on it, I just won’t be able to play it. And it helps to work on... if there’s a difficult part in

the piece of music, and it's just that one or two measures that's getting you, then it's helpful to work on that first." Similarly, Sophia also spent additional time on the hard parts: "If I got caught up on something, I just spent a little extra time on that. And when I got that, I would move on, just so I could get through the entire thing... And then once I got through all the piece, I went back to the harder spots." David explains this strategy in a bit more detail: "Then I went back to the parts where I either miscounted or I just missed something, like... right in here some of the quarter notes I would play too short. So I would go back and, from a certain section, I might start a little bit slower than I did. And then try to play through bit by bit what part was hard until I felt I was confident with it. And then I moved on." When asked why he chose to isolate specific spots rather than play the whole thing, David said, "Just doing it over and over again doesn't help because then you're wasting your time on the parts you don't need work on, when you could just focus on the parts that are harder."

When practicers did isolate difficult sections, they targeted either rhythm, shifting, intonation, or bowing. Many were able to describe what exactly was difficult about the spot. Anna, for example, was explaining why the rhythm in measure 1 was challenging for her: "The whole time I was trying to get a rhythm. And then when I... I mean, the dotted quarter notes, I couldn't really get those. So I was trying different ways to try to get that. But I couldn't really tap my foot and do it all [at] the same time because I don't have that type of coordination." David also experienced challenges due to rhythm: "On [measure] 14, I wanted to play the A longer than an 8th note, and then same with 22. I wanted to play it longer than a 16th note because I was so used to everything else." Melissa was able to identify difficult spots in the music in the following way: "I went back to parts where I wasn't completely sure what the rhythm was. Like, I needed to count them out before I could play them successfully."

Several violinists, including Lacy, experienced challenges with shifting, but could clearly articulate what the difficulty was. She points out: “I remember here, measure 12, I wanted to change back to 1st position, [but] it was easier to stay in 3rd for this whole line.” Laurel describes how she dealt with difficult shifts: “I was the shifting part right when... I barely saw it. I had to stop and think. I was just working through it and trying to follow the fingerings that were put there... I was trying to instead of playing it in position, like, shifting back [to 1st position] to see what it was actually supposed to sound like.”

Practicers also targeted difficult spots for intonation and bowings. Jordan describes an intonation challenge: “In measure 5... that C. I was having a hard time finding that because I kept on playing a C# instead of a C natural. So I would have to go over the parts where there was that high C so that I could keep on reminding myself that I shouldn't play C#.” Julie also reflected on pitch problems she experienced: “I was struggling with a couple of the note accuracies. F# here [in measure 6] was always too high for me.” Mark chose to work on bowings that were difficult for him, describing the process as: “I wanted to play the slurs. Like, correct bowings. When I got to the slurs, I had to time it to get the notes right... What I mean is, play the note for the length that it, play the note length while moving to the next note and playing that note length [all in the same bow direction].” David found that his bowings sometimes ended up backwards when a bowing symbol was marked in the music: “Every now and then an up bow, or I'd forget there was an up up or a down down thing. The slurs weren't that hard, but it was like... when there was nothing [marked in the part] and then they would just kind of tell you what the bowing was. If I found out I... had the wrong bowing on that, I'd go back a couple measures.”

Practicers used several methods to work on difficult sections. One method exclusive to the practice group in this study was slow practice. Abigail defines slow practice as “redoing the

same thing over and over again at a slow pace until you're able to play it [at the] normal tempo.” She describes the slow practice process as “Going over the measures that trip you up slowly, then speeding up maybe an hour, minimum... You always take it slow.” Once the music sounds good to her at a slow speed, she says: “Maybe [I'll take it] a little faster since I've already repeated stuff just a little bit faster. But if it didn't sound good faster, I'd slow it down again.” Julie uses a similar slow practice strategy of “playing through slowly to start with and just gradually speeding up,” while P1 fixes mistakes by “go[ing] back, play[ing] through it slowly, and try[ing] to get it right.”

Like memorizers, practicers also segmented the piece into more manageable chunks. But while memorizers segmented with the ultimate goal of reassembling the sections holistically, practicers segmented as a way to manage difficult sections. The segmentation that practicers used was primarily based on 2-line phrases, but practicers did not make a conscious effort to combine sections into a whole. Rather, the lines mainly provided a convenient starting and stopping place. Jordan describes the beginning of the fifth line, measure 17: “17 is... an easy point to look at; it's the beginning of the line.” Many practicers, such as Craig, described dividing the piece into three phrases: “I would divide it up into chunks. Probably [measures] 1-8, 9-16, and 17 to the end... So we'd take two lines at a time.” In explaining her rehearsal session, Abigail reveals that she segmented only to isolate difficult spots as she went through the entire piece: “[I] stopped at the shift, reworked measure 4, 5, 6, 7, and 8 at least four times. [I] went through the rest, stopped at measure 11 to get... 10 and 11 to get the shift right. [I] did that a couple times [and] kept going. [I] stopped at 14 to make sure I was going the 4th [finger] to 2nd [finger] right. And then 14, 15, those two to make sure it sounded okay. And then I just went through this [the last two lines] because there was no shifting in it.” Julie used line-by-line

segmentation to work through difficult spots. “I kinda [*sic*] went back to I think a few measures back that I didn’t do right, and then I’d play the line.” A few practicers segmented the piece into unique sections that were not based on lines or phrases at all. David, for example: “I started at 10 since that was a good starting point, and I ended at 16.”

Practicers employ serialistic and holistic strategies. Practicers, much more so than memorizers, were interested in playing the entire piece from beginning to end. This resulted in the use of two rehearsal strategies unique to the practice group: serialistic rehearsal and holistic rehearsal. In holistic rehearsals, participants practiced the entire piece from beginning to end. Laurel described her rehearsal as, “I tried to start at the beginning and play toward the end [to] see if I could play the whole thing through.” After working on a few difficult spots, she decided she would “just keep playing it through” until her rehearsal ended. When I asked Macy if she worked on any difficult sections, her answer was “I think I messed with that one, [measures] 21 and 22 probably together. But other than that, I’m pretty sure I just went through [the whole piece].” Sophia had one primary rehearsal technique, which she described as “I mostly would just run through the piece.” Using the same plan, David said: “I then played all the way through once I got it down... I’d... play it all the way through again. Just kind of the same thing I did.” When asked if he divided the piece into sections, P4 responded no. He played “from the beginning to the end” and “would just put them [the lines] together from the top.”

In serialistic rehearsals, participants began at the beginning of a piece, but stopped when an error occurred and returned to the beginning for another attempt (Mishra, 2011). Several practicers adopted a mostly serialistic approach in their rehearsal. David, who also used a holistic approach, described his serialistic technique: “After I had worked out all the pieces [I went back to the beginning]... [I had] just some slip-ups so then I just started over... because I wanted to

get it all the way through.” Evan also explained his serialistic rehearsal: “Go through it without stopping. I wanted to get all the way through the piece.” When asked what he did when he reached the end, Evan said, “[I] restarted it and did the same thing again.” Mark had a similar plan. When he made a mistake, he would stop and “work on that measure.” Then he “played the whole thing again.” After he fixed his mistake spots and finally made it to the end, he “played the piece again... and [did] the same process.”

Chapter 5

DISCUSSION

In this study, I argued that because the characteristics of memorization as a learning process appear to increase student self-regulation, memorization may yield more specific goals for students than practice. This is because the characteristics of memorization as a music learning process include self-evaluatory processes, which are driven by prior goal-setting. My inquiry was guided by two primary research questions: 1) What is the effect of directions (i.e., to practice or to memorize) on levels of specificity in self-reported student goals for individual rehearsal? 2) How do directions to practice or to memorize impact self-reported student use of rehearsal strategies during individual rehearsal?

Goal Specificity

Addressing the first research question, I hypothesized that there would be a significant difference in goal specificity between students asked to practice or memorize a melody. Results indicated no significant difference ($p > .05$) between the practice and memorization groups' median specificity scores, and thus I failed to reject the null hypothesis.

These findings support those of previous researchers. Although novice memorizers tend to demonstrate more self-regulatory behaviors (Hallam, 1997, 2001b; McPherson & Renwick, 2001, 2002), they are still inexperienced at self-monitoring their practice, and thus have difficulties setting specific goals for themselves (Hallam, 1997; McPherson & Renwick, 2001; Pitts et. al, 2000a, 2000b; Rohwer, 2005). Novice students in the present study demonstrated similar difficulties. Although some participants from both groups were able to articulate specific goals, the median specificity scores per participant generally fell between 2-3 points on the Likert rating scale, indicating that their goal statements were primarily nonspecific. Because goal

specificity scores did not vary significantly between the practice and memorization groups, it may be presumed that novice students have difficulties explaining their rehearsal goals. This does not, however, indicate that students are not demonstrating characteristics of specific goal-setting during rehearsal. One possibility may be that students are able to carry out specific goals without being able to explain precisely what they are doing and why they are doing it. Students lacking an ability to articulate their goals may explain why changing the instructions (i.e., to practice or to memorize) was ineffective in changing the specificity of goal statements. Further research is needed, however, to confirm why novice students seem unable to articulate specific goals and if students are in fact carrying out specific goals even if they are unable to articulate them.

This finding suggests that changing the instructional verb from ‘practice’ to ‘memorization’ may not be as outwardly effective as originally hypothesized in changing the specificity of students’ goal statements. What may be more useful is for teachers to help students identify problematic errors and give them strategies to fix those errors. This, in turn, may help students shape more specific goal statements during self-monitored practice, although further research is warranted.

Rehearsal Strategies

Despite the fact that changing directions did not affect students’ level of goal specificity, (ability to articulate specific goals), students may still be demonstrating specific goal-setting through the way they rehearse. Practicers and memorizers produced two distinct sets of rehearsal behaviors which highlight differing strengths and weaknesses of each directive.

Memorizer Profile

Memorizers tended to focus on broader goals rather than technical details in the piece, with the ultimate goal of memorizing a realistic portion of the piece within a given time constraint. For example, memorizers tended to set goals like “I want to memorize the first two lines of the piece,” instead of, “I want to get the rhythm correct in measure 22.” To attain broad goals, memorizers selected strategies such as over-learning the piece of music through repetition and segmenting with the intention of putting the segmented parts back together again.

Memorizers combined their selected rehearsal strategies into a highly-organized schema. First, they broke the piece down into small segments of two to four measures. Second, they rehearsed the target measures repeatedly, both with and then without the music, until they were satisfied that it was memorized. Third, they repeated the same process again with the next two to four measure section, and fourth, they joined the targeted sections together into a larger musical unit and rehearsed the larger section until it they deemed it “learned.”

Memorizers also monitored their performance for signs of improvement or problems by frequently testing themselves without the written score. In doing so, they sought to create mental representations of the music, which they could then compare with their performance. As one participant, John, stated, “how you know it’s supposed to sound.” Alongside self-monitoring progress, memorizers also sought to manage their time by choosing a portion of the piece to learn given their time constraints. Time constraints, when combined with the forgetfulness prone to memorization, however, may create anxiety and frustration among memorizers, as memorization is a very time-consuming process.

Practicer Profile

Practicers set goals that are detail-oriented and focus on specific aspects of the music, such as the rhythm, intonation, shifting, or bowings. Practicers identified difficult rhythms, pitches, shifting spots, and bowings by first scanning the music in search of sections they think will be challenging. During rehearsal, they jumped from problem to problem within the piece, targeting previously identified difficult sections, or new problems that emerged as they rehearsed.

To correct problematic spots, practicers primarily used rehearsal strategies such as repetition, serialistic practice, holistic practice, or slow practice. Most practicers worked exclusively through repetition, selecting a difficult passage to repeat for a predetermined amount of time, a predetermined number of repetitions, or until they thought it had improved. Sometimes, practicers incorporated slow practice into their repetitions by rehearsing the passage slowly then increasingly faster until it is back at the performance tempo. In addition, practicers also displayed rehearsal behaviors, such as serialistic and holistic rehearsal, which can be less effective overall (Mishra, 2011). Serialistic practicers start at the beginning of the piece, stop when they make a mistake, then restart at the beginning of the piece. Holistic practicers play through the entire piece repeatedly, without segmenting the music into smaller portions.

Implications: Linking to Deliberate Practice

Both groups of participants in this study displayed characteristics of deliberate practice, which is a manifestation of the self-evaluatory cycle. Deliberate practice, defined as a structured activity with the explicit goal of increasing an individual's current level of achievement (Ericsson & Lehmann, 1999), improves achievement through three self-teaching activities: planning and preparation, execution, and observation and evaluation (Ericsson et al., 1993).

Planning and Preparation

Although novice students were unable to articulate specific goals, their rehearsal behaviors demonstrated that they were planning and preparing rehearsals according to specific goals. Both memorizers and practicers had some structure to their rehearsal that were based off their priorities. For most, starting rehearsal by figuring out the meaning of symbols on the page, such as key signature and time signature, was most important. After that, learning the notes or rhythms took priority. Of lowest importance were expressive markings like dynamics and articulations.

When learning notes and rhythms, practicers planned their rehearsals around difficult, technical aspects of the piece, which indicates that they are setting focused, specific goals. While they evidenced clear planning and preparation for immediate goals, such as working on a difficult rhythm or bowing, they tended to flit from spot to spot without a larger, more cohesive goal in mind. Practicers did, however, evidence setting some larger goals when they practice holistically. These situations occurred much less often than their targeted practice on technical aspects of the piece. In general, they tended to lack a broader objective for the rehearsal.

In contrast, memorizers had a system in place to work on their holistic goal of memorizing the piece, which was organized by segmenting two to four measures chunks, memorizing them, and putting them back together. Memorizers had a pre-built plan in place that was structured around small, specific goals of memorizing a chunk of music, which combined into the larger overall goal of memorizing the piece. Generally, memorizers seemed prepared to execute their goals efficiently because they had a well-defined plan in place that included both specific immediate and holistic goals.

Teachers should use the systematic way memorizers accomplish goals to their advantage. Requiring students to memorize music will help reinforce the desirable goal-setting behaviors that memorizers are already demonstrating, such as being able to set both small and larger rehearsal goals. Since practicers are weaker in setting holistic goals, teachers who ask novice students to practice might consider structuring short- and long-term goals for their students at first to provide a template that students can use later during individual rehearsal. Teachers of all novice students should make efforts to coach them through articulating their rehearsal goals, since novices are still able to demonstrate specific goals through their planning and preparation for rehearsal activities. By working together with teachers to put words to their rehearsal goals, students may become more aware of what they are doing and may be able to more consciously set specific goals.

Execution

After preparing for rehearsal, memorizers and practicers carry out goals using unique rehearsal strategies. While both groups use repetition extensively, the material that is repeated differs depending on the group. Memorizers repeat segments divided up by measure, whereas practicers repeat difficult material, whether that is three notes or three lines of the piece. The result is that memorizers end up with multiple repetitions of every single note in the chosen rehearsal section, while practicers may have repeated some notes many times and other notes not at all.

Novice memorizers stick almost exclusively to repetition and segmentation as their chosen rehearsal strategies. In contrast, practicers use strategies like slow practice, serialistic practice, and holistic practice in addition to repetition. Slow practice gives the student an opportunity to work through a section under tempo and then speed it back up, which involves

multiple repetitions based on a highly specific goal, making it a very efficient strategy. Practicers also use less efficient serialistic and holistic strategies. Serialistic practice is a reactive strategy; instead of going into the rehearsal with a clear goal, students react to an error by starting the entire piece over again and hoping for a better result the next time through. Practicers who demonstrated a holistic strategy often articulated extremely vague goals like “I wanted to get it right.” Holistic practice was more prevalent towards the end of the 10-minute rehearsal period when they felt like they had already learned the piece and didn’t know what to do next.

Because practicers have a tendency to use ineffective strategies such as serialistic and holistic practice, teachers might consider modeling effective practice strategies before sending students off to practice on their own. When novice practicers don’t know what to do, they tend to default to holistic repetitions, which, although still practice, is a less efficient means of improvement than targeted repetitions. Once practicers have worked through difficult sections through targeted repetitions however, holistic practice is important so that the difficult sections are then linked together and reintegrated back into the piece of music. Teachers must work carefully to balance segmentation for difficult sections with holistic practice so that students understand how to use both strategies effectively.

Teachers who decide to use memorization with their students can comfortably assume that, given adequate time, novice memorizers will both segment the piece and then link sections back together into a whole. These students, however, lack the variety of strategies seen in novice practicers. If teachers want students to have a broad repertoire of rehearsal strategies from which to choose, they must consciously teach alternative strategies to novice memorizers. Strategies such as slow practice could be very beneficial to novice memorizers, but they must be taught how to implement these strategies while memorizing.

Observation and Evaluation

The final self-teaching activity in deliberate practice, observation and evaluation, is where memorizers and practicers are most distinctly different. Memorizers evidence many self-evaluatory behaviors, such as testing themselves without the written score, glancing at the music as they play, and comparing their performance with a mental representation of the piece. Memorizers acquire mental representations by listening to recordings, listening to their peers, listening to themselves, and visualizing the music. As they play, they compare and contrast their performance to what their mental representation sounds like; differences between the two are evaluated to figure out where the error occurred. Testing without the score and glancing give memorizers a way to check and see if they have truly memorized the material; if they are able to play all the way through the targeted section without looking, then they know it is memorized. Memorizers also modify how much of the piece they will be able to learn in a set amount of time based on the results of their self-evaluations. They are constantly asking themselves, “Do I have enough time to memorize as much of the piece as I planned, or do I need to modify my goal?” Memorizers use self-evaluation to determine whether the goal is attainable within their time frame, and they adjust their goal as needed. In the present study, most memorizers had to adjust their goal from memorizing the whole piece to memorizing half of the piece due to the 10-minute time constraint.

In contrast, practicers may not evaluate and reflect on their rehearsal to the same degree as memorizers. While they are clearly able to identify difficult spots in the music, they do not consistently show an ability to reflect on how well they rehearse difficult spots or tell if they are improving. Most practicers practice a targeted section for a set number of repetitions or for a set amount of time, and then move on to the next section without considering if the problem has

been fixed. Sometimes practicers work on a problematic spot until they think it is “good enough,” but they have a difficult time explaining what it means for that passage to be “good enough.” It is unclear if they actually have a standard of achievement that they are trying to reach, or if they have just noticed some sort of improvement and decided that because it is better than it was, that it is good enough.

Perhaps one reason why memorizers demonstrate more self-evaluatory behaviors than practicers is because of the specificity of memorization as a goal. When teachers ask students to memorize a piece of music, students have a clear understanding of what that means to them—they need to be able to play the piece without looking at the sheet music. Because students know exactly what the end product should be (i.e., being able to play every note without looking), they know what standard to compare themselves to as they rehearse. In contrast, practicers aren’t always sure what broader goal they are working towards, so they aren’t aware what the final product should look and sound like. Teachers can help practicers self-evaluate by giving them more specific end goals to work towards. They can do this in many ways, such as having students listen to recordings of the piece or modeling the desired end product for their students. Providing practicers with an aural model of the piece helps them form mental representations of how the piece *should* sound, which they can then compare themselves to. When students have a strong mental representation of the piece, it may be easier for them to self-evaluate during their personal practice time.

Contributions of Study and Future Research

This study is the first to create distinct profiles of memorizers and practicers who come from the same educational setting. No study to date has examined rehearsal behaviors of

memorizers and practicers who come from the same ensemble, so the findings of this study allow researchers to compare groups of students who have the same musical background.

From the results, educators and researchers will have new information about what behaviors they can expect to see when students are asked to either practice or memorize music.

Future research may want to examine ways to improve planning and evaluation for practicers engaged in deliberate practice. Perhaps by defining “practice” more specifically, novice students would have a clearer idea of how to shape their rehearsal, which might produce results similar to those of memorizers. Although neither practicers nor memorizers were able to articulate specific goals in this study, another directive may be able to change the way novices explain goal specificity. The ability of directions to alter rehearsal behaviors may also extend past memorization and practice. Other directions may also change how students view rehearsal; future studies could examine the effects of other directives on students’ rehearsal behaviors. Most interestingly, maybe there is a way for novices to articulate their specific goals. If they are demonstrating behaviors consistent with specific goal-setting, they must have a specific intent, even if they can’t describe it. Finding a way for novices to explain *what exactly* they are doing and *why* would enable educators and students to work more effectively together.

Conclusion

Deliberate practice is essential to effective practice, but previous research has shown that students often struggle to articulate specific goals. Because memorization produces self-evaluatory behaviors, memorizers must also be setting goals beforehand. I argued that memorization may yield more specific goals for students than practice. Although students who memorized and practiced in this study showed no significant differences in the specificity of their goal statements, there were distinct differences in rehearsal behaviors between the two

groups and in their ability to engage in deliberate practice. Based on the profiles of memorizers and practicers, teachers may be able to adjust their instructions to target specific rehearsal strategies and promote deliberate practice by teaching students to implement both memorization and practice behaviors in their self-monitored rehearsals. Both memorization and practice have benefits for students, so it is important for teachers not to neglect one or the other. Teachers should strongly consider incorporating memorization into their classrooms, in combination with practice, to produce novice students who are capable of multifaceted, deliberate practice.

Limitations

Findings from this study should be interpreted with caution. Because this was a qualitative study with a small sample size, results cannot be generalized to the larger population. Future studies could address similar research questions with a larger, quantitative sample in order to generalize results. Participants in this study were also selected from a convenience sample and may not accurately represent the larger population. Ideally, participants would be randomly selected from a larger pool of potential participants in order to obtain a truly randomized sample.

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APPENDICIES

Appendix A: *Gentle John* Violin 2 Part

Violin 2

Gentle John

Henry Purcell
(1659-1695)

The musical score is written for Violin 2 in G major, 3/4 time, with a tempo marking of quarter note = 69. The piece consists of 24 measures. The score is divided into six systems of four measures each. The first system begins with a dynamic marking of *mf*. The second system includes a triplet of eighth notes in the second measure. The third system features a dynamic marking of *sfz* and a fermata over the final measure. The fourth system contains a fermata over the final measure. The fifth system includes a fermata over the final measure. The sixth system concludes the piece with a fermata over the final measure. The score includes various musical notations such as slurs, accents, and dynamic markings.

Appendix B: *Gentle John* Violin 3 Part

Violin 3

Gentle John

Henry Purcell
(1659-1695)

$\text{♩} = 69$

mf

5

9

sfz

13

17

21

The viola and cello parts both started on the same G fingering as the 3rd violin part (G on the D string). Basses began on the open G string.

Appendix C: Goal Specificity Likert-type Scale

Goal Specificity Assessment

Rate the specificity of the following goal statement on a scale from 1-5. (1- Nonspecific; General, 2- Somewhat specific 3- Moderately specific, 4- Specific, 5- Highly specific)

[Insert Goal Statement]

	1	2	3	4	5	
Nonspecific: General	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly specific

SUBMIT

1- Nonspecific/General: A **vague objective**, such as “I did my best.”

2- Somewhat specific: Includes **only processes** for completing the goal, such as “I played measures 1-4.”

3- Moderately specific: Includes **processes and a vague objective** for completing the goal, such as “I tried to memorize by playing measures 1-4.”

4- Specific: Includes **either detailed objectives or detailed processes** for completing the goal, such as “I closed my eyes when I played measures 1-4 and only opened them if I couldn’t remember the next note.”

5- Highly specific: Includes **detailed objectives and processes** for completing the goal, such as “I wanted to be able to play measures 1-4 without looking at the music, so I closed my eyes and only opened them if I couldn’t remember the next note.”

Appendix D: Parental Informed Consent Statement

PARENT/GUARDIAN INFORMED CONSENT STATEMENT

“The Effects of Practice and Memorization Techniques on Goal Specificity Among Novice String Students”

Lauren E. Rigby, Principle Investigator

INTRODUCTION

The Division of Music Education and Music Therapy at the University of Kansas supports the practice of protection for human subjects participating in research. The following information is provided for you to decide whether you wish to participate in the present study. You may refuse to sign this form and not participate in this study. You should be aware that even if you agree to participate, you are free to withdraw at any time. Withdrawing from this study will not affect your relationship with USD 497, Lawrence High School, the services they may provide to you, the researcher, or the University of Kansas.

PURPOSE OF THE STUDY

The purpose of this study was to compare differences between self-reported goals of high school orchestra students when given directions to either practice or memorize music during a 10-minute rehearsal.

PROCEDURES

During the week of _____, a researcher from the University of Kansas will attend orchestra class at Lawrence High School, video record individual participants rehearsing on their instruments, and convene audio-recorded interviews with participants. Participants will be asked to rehearse and answer interview questions once for a total of 30 minutes. If additional information is needed from your child, the researcher may ask for another interview. Your child may accept or decline the request. If your child accepts the request, another interview will be scheduled at a mutually agreed upon time. All rehearsals and interviews recorded by the researcher will be conducted at Lawrence High School. Music for the rehearsal will consist of an age-appropriate piece selected from an established repertoire book. Interview questions will inquire about 1) what the instructions I will give to your child mean to him or her, and 2) what your child did and wanted to do when he or she learned the piece.

RISKS

Your child will encounter no greater probability of harm or discomfort than he or she would ordinarily encounter in daily life.

BENEFITS

Although there are no direct benefits to students, your child will be asked to reflect on his or her goal-setting practices during rehearsal, which may help your child practice more effectively and with more self-awareness in the future.

PAYMENT TO PARTICIPANTS

No payment or incentives will be offered to students or parents in return for participation in the present study.

PARTICIPANT CONFIDENTIALITY

Your child's name will not be associated with any data collected or used in the publication or presentation of this study. The researcher will use a study number in place of your child's name. Your child's identifiable information will not be shared unless required by law or unless you give written permission.

All video and audio recordings and files will be stored in a secure location. Only the researcher and her thesis advisor, Dr. Jacob Dakon, will have immediate access to these records. For reliability purposes, three other evaluators will be asked to analyze parts of the rehearsal videos to ensure accuracy. All video and audio recordings and other files will be destroyed once the study has been completed.

Your written permission to use and disclose your child's information remains in effect indefinitely. By signing this form you give permission for the use and disclosure of your child's information, excluding your child's name, for purposes of this study at any time in the future.

REFUSAL TO SIGN CONSENT AND AUTHORIZATION

You are not required to sign this Consent and Authorization form and you may refuse to do so without affecting your right to any services you are receiving or may receive from the University of Kansas or to participate in any programs or events of the University of Kansas. However, if you refuse to sign, your child cannot participate in this study.

CANCELLING THIS CONSENT AND AUTHORIZATION

You may withdraw your consent to allow the participation of your child in this study at any time. You also have the right to cancel your permission to use and disclose further information collected about your child, in writing, at any time, by sending your written request to:

Lauren Rigby, Principle Investigator
Music Education and Music Therapy Department
University of Kansas School of Music
Murphy Hall, 1530 Naismith Dr., Office 408
Lawrence, KS 66045-3103

If you cancel permission to use your information, the researcher will stop collecting additional information about your child. The research team, however, may use and disclose information that was gathered before they received your cancellation, as described above.

QUESTIONS ABOUT PARTICIPATION

Questions about procedures should be directed to the researcher(s) listed at the end of this consent form.

PARTICIPANT CERTIFICATION

I have read this Consent and Authorization form. I have had the opportunity to ask, and I have received answers to, any questions I have regarding the study. I understand that if I have any additional questions about my rights as a research participant, I may call (785) 864-7429, write to the Human Subjects Committee Lawrence Campus (HSCL), University of Kansas, 2385 Irving Hill Rd., Lawrence, KS 66045-7568, or email irb@ku.edu.

I agree to allow my child to take part in this study as a research participant. By my signature I affirm that I have received a copy of this Consent and Authorization form.

Type/Print Participant's Name	Date
Parent/Guardian's Signature	Relationship to Participant

Researcher Contact Information:

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Appendix E: Minor Informed Consent Script

ASSENT FORM (MINORS)

“The Effects of Practice and Memorization Techniques on Goal Specificity Among Novice String Students”

Lauren E. Rigby, Principle Investigator

“My name is Lauren Rigby and I am a researcher from the University of Kansas. I would like to record you learning a piece of music on your instrument and then ask you a few questions about how you learned it. Is that ok? [Verbal Consent] When I record you, I will use this video camera. No one will watch your video except for me and another researcher at the University of Kansas. Your teachers, parents, and the other members of the orchestra will never see this video. After we record the video of you learning a piece of music, I will ask you some questions. These questions will cover: 1) what the instructions I will give you mean to you, and 2) what you did and wanted to do when you learned the piece. Feel free to talk as much as you would like about each question. The more information you can provide to me, the better. Can you repeat for me what I have asked you to do? [Assess participant’s understanding of the instructions]. Your responses to the questions will also remain anonymous. If you don’t feel like participating in this experiment or answering the questions afterwards, you don’t have to; the choice is yours. You may also quit at any time throughout the experiment without penalty. Do you consent to participate in the video and questions? [Wait for verbal consent- If yes] Are you ready? [If no] Thank you for your time today.”

Appendix F: Student Goal Statements and Ratings

Example Memorizer Goal Statements

- 1- **Nonspecific/General:** “Get the first line”
- 2- **Somewhat specific:** “Looking over at the different, like, key signature and everything.”
- 3- **Moderately specific:** “I played through the entire first part and made sure that I didn’t have anything messed up. Because at first, I played the first measure too slow and stuff.”
- 4- **Specific:** “Like this accidental and right there, I wasn’t getting the rhythms right and so my goal was definitely to fix that (measures 12 and 20).”
- 5- **Highly Specific:** “I was trying to just do the first two lines because I didn’t think I could do the whole thing anyway. So I was just trying to do the first two lines, so I just played those a bunch. [I wanted to] be able to play it with good pitch and all the bowings right and the markings, like the tenuto marks, get those. And actually play it musically and not just focus on the notes and memorizing it.”

Example Practicer Goal Statements:

- 1- **Nonspecific/General:** “I’m just going to try to do this. I’m just going to try; it doesn’t really matter.”
- 2- **Somewhat specific:** “Play the first two measures, then the next two, and the next two, and then kinda go over it section by section.”
- 3- **Moderately specific:** “[I] played the entire piece first. I wanted to see how it sounded as a whole, try and, I don’t know, yeah... and saw the hard spots and tried to work on those.”
- 4- **Specific:** “And then I would find the parts that were a little more difficult and try to go back to those. So like, measures 4 and 5. Measure 22, oh yeah, the shift from er, 8 and 9 going to that E, going to that open E.”
- 5- **Highly specific:** “Right in here some of the quarter notes I would play too short, so I would go back and, from like a certain section, I might start a little bit slower than I did. And then try to play through bit by bit what part was hard until I felt I was confident with it.”