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An Investigative Study Measuring Self-Reported Metacognitive Habits Among Collegiate Piano Majors

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AN INVESTIGATIVE STUDY MEASURING SELF-REPORTED METACOGNITIVE HABITS AMONG COLLEGIATE PIANO MAJORS

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ABSTRACT

The purpose of this study was to investigate self-reported metacognitive habits among collegiate piano majors. It examined the degree to which participants comprehend and employ practice strategies, recognize their own strengths and weaknesses in learning and performing, accurately predict a performance outcome, and self-evaluate following a performance. A total of twelve \((N = 12)\) participants, six \((N = 6)\) undergraduate and six \((N = 6)\) graduate piano majors, enrolled in applied lessons at the University of South Carolina School of Music volunteered to participate in this study. Participants completed a pretest questionnaire that measured their own metacognitive skills, performed and received evaluation from a faculty evaluator, and self-evaluated following their performance.

Results of the Pearson product-moment correlation coefficient revealed a positive correlation \((r = .710, p = .010)\) between pretest questionnaire composite scores and evaluation scores. This indicated that an increase in pretest questionnaire composite scores varied with an increase in evaluation scores among participants. As the pretest questionnaire measured participants’ metacognitive habits, results from this study may suggest that collegiate piano majors who possess a greater measure of metacognitive skill may also achieve higher performance evaluation scores than collegiate piano majors who possess a lower measure of metacognitive skill.
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CHAPTER 1
INTRODUCTION

Successful music learners rely on habits of self-awareness and self-evaluation; they are independent, capable of assessing task-difficulty, strategizing towards task-completion, and appraising outcomes (Pogonowiski, 1989; Hanna, 2007; Benton, 2014). They have mastered rudimentary skills of planning, organizing, and monitoring progress; they do not exclusively rely on teacher-input (Byo and Cassidy, 2008; Leon-Guerrero, 2008; McPherson and Zimmerman, 2001; Miksza, 2012). They independently manage their own emotional states when faced with challenges and setbacks; they are less prone to discouragement; they are self-motivated, aware of their own limitations and potential (Cross and Paris, 1988; Martinez, 2006). They possess a diverse set of domain-transcendent and domain-specific skills—among them, overarching and fundamental, are skills of metacognition (Miklaszewski, 1989; David and Scripp, 1990; Hallam, 1997; Schraw et al., 2006; Scott, 2006; Kerka, 2006).

In 1979, American developmental psychologist John H. Flavell introduced the term metacognition, describing it as “one’s own knowledge concerning one’s [own] cognitive processes and products or anything related to them” (Flavell, 1979, p. 906).¹ Nearly a decade later, Cross and Paris defined metacognition as “the knowledge and

¹ John H. Flavell specialized in children’s cognitive development. Recipient of the 1984 Award for Distinguished Scientific Contribution, Flavell is author of numerous books, including The Developmental Psychology of Jean Piaget, Cognitive Development, and Young Children’s Knowledge about Thinking.
control [individuals] have over their own thinking and learning” (Cross and Paris, 1988, p. 131). Taylor (1999) described metacognition as “an appreciation of what one already knows, together with a correct apprehension of the learning task and what knowledge and skills it requires” (Taylor, 1999, 42). In its simplest form, metacognition denotes “cognition about cognition” or “thinking about thinking” (Flavell, 1979, p. 906), and despite minor differences in defining metacognition, researchers agree that metacognition comprises two parts: (1) cognitive knowledge and (2) cognitive regulation (Cross and Paris, 1988; Flavell, 1979; Schraw et al., 2006; Whitebread et al., 1990). Cognitive knowledge concerns one’s awareness of his or her own strengths and weaknesses as a learner, knowledge about factors that may affect learning, and knowledge about what strategies to employ for successful learning (Flavell, 1979). Self-regulation affects the monitoring of one’s own cognition, including planning, regulating, and evaluating learning or performance tasks (Cross and Paris, 1988; Schraw and Moshman, 1995, Schraw et al., 2006). Simply put, whereas cognitive knowledge concerns ‘knowledge’ of self, cognitive regulation concerns ‘control’ of self.

Researchers identify domain-transcendent qualities of metacognition, linking it to other cognitive functions such as working memory, reasoning, inhibitory control, and planning, all of which are necessary for the cognitive control of behavior (Adele, 2013). Halpern described metacognition as the “boss” function that supports planning, monitoring, and execution of learning-tasks (Halpern, 1998, p. 454). Others relate metacognition to critical thinking, including its components of argumentative analysis.

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2 Webster’s New World College Dictionary defines *meta* as meaning “going beyond or higher, transcending: used to form terms designating an area of study whose purpose is to examine the nature, assumptions, structure, etc. of a (specified) field [such as metadata, metalinguistics, metamemory, etc.].”
(Ennis, 1985; Paul, 1992), inductive or deductive reasoning (Willingham, 2007; Paul, 1992), judging or evaluating (Case, 2005; Ennis, 1985) and problem solving (Ennis, 1985; Willingham, 2007).

Researchers note the beneficial application of metacognition to music learning, music teaching, and independent practice (Pogonowski, 1989; Hanna, 2007; Benton, 2014). In Dimensions of Musical Thinking (1989), a Music Educators National Conference (MENC) publication, contributing author Lenore Pogonowski affirmed metacognitive theory as representative of 1 of 4 dimensions in musical thinking, asserting that metacognitive skills might assist music learners in controlling their own learning processes, help them become more aware of their own skills, and free them from exclusively rote-based learning (Pogonowski, 1989). In a revised version of Bloom’s taxonomy that was published in 2001, editors expanded the original 4 learning objectives to 6: (1) remembering, (2) understanding, (3) applying, (4) analyzing, (5) evaluating, and (6) creating. Hanna explained, “Developing metacognition can help music learners to become more objective about their overall musicianship. If learners lack metacognition—that is, if learners are not able to ‘think about musical thinking’—their musicianship will plateau and fail to progress” (Hanna, 2007, p. 14). Dr. Carol W. Benton wrote the landmark book, Thinking about Thinking: Metacognition for Music Learning (2014), which provides an informative overview of metacognition, addressing specific research

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3 The Music Educators National Conference (MENC) was the previous name of the National Association for Music Educators (NAfME). The MENC held its title from 1934 to 1998 after which it changed to “MENC: The National Association or Music Education.” In 2011, the organization changed its acronym from MENC to NAfME and in 2012 the organization officially adopted the name “National Association for Music Educators” (nafme.org).

and application of metacognitive skills for the applied and classroom music teacher, including self-reflection, self-regulation, and self-evaluation (Benton, 2014).

**Purpose of the Study**

The purpose of this quantitative study was to measure self-reported metacognitive habits in relation to self-evaluation accuracy among collegiate piano majors. It investigated the degree to which participants comprehended and employed practice strategies, recognized their own strengths and weaknesses in learning and performing, accurately predicted a performance outcome, and self-evaluated following a performance.

**Need for the Study**

Since Flavell first introduced the notion of metacognition, the predominance of metacognitive research has been domain-transcendent, offering general principles of theory or application to fields of study unrelated to music. Often there has emerged relevant data for the music teacher, such as notions of self-knowledge, self-evaluation, planning, and monitoring. But there exists problems in translating conclusions about metacognition in the general sense into meaningful conclusions for the music teacher. Music learning involves more than cognitive knowledge, it also comprises skill development in psychomotor and affective domains. These complexities can result in challenges when transferring general information about metacognition into specific application for the piano teacher. So, there exists a need for further study into metacognitive theory as it applies to the field of piano pedagogy.
As researchers have examined specific aspects of music practice through questionnaires (McPherson, 2000), interviews (Nielsen, 2004), and videotaped practice (Barry, 1992; Hallam, 1997), metacognitive habits of self-regulation and self-evaluation have proven to be most determining of effective learning and successful performing. Moreover, research offers empirical evidence that metacognitive skills are “teachable” (Cross and Paris, 1988; Kramarski and Mevarech, 2003). Kuhn and Dean (2004) make claims for the necessity of providing teachers with mechanisms for fostering metacognition among their students. Similarly, Martinez describes the problem of teachers lacking an awareness of the multitudinous dimensions of metacognition and their significance in cultivating higher-level thinking (Martinez, 2006, p. 696). Schneider also emphasizes the significance of teachers’ responsibility for developing metacognition among students (Schneider, 2008).

Understanding and applying metacognitive theory to piano pedagogy may hold the potential to provide piano teachers with strategies for developing more capable and self-sufficient learners and performers. Cognitive knowledge may relate to the piano performer’s experience of measuring his or her own comprehension of musical and technical detail within repertoire, evaluation of repertoire-difficulty, identification of factors that may impact successful learning, and implementation of strategies for effective problem-solving when practicing. Cognitive knowledge may also hold application to the piano teacher’s awareness of personal strengths and weaknesses in learning and teaching, as well as his or her own capabilities in choosing appropriate repertoire for students, and means of understanding and communicating effective practice methods and strategies to students. Cognitive regulation may concern the performer’s
abilities to set goals and monitor progress, evaluate practice effectiveness, and appraise performance-quality. For the piano teacher, cognitive regulation relates to the experiences of evaluating students’ practice effectiveness, implementing and monitoring instructional strategies for error detection and correction in lessons, evaluating student-performance quality, and instructing students in use of metacognitive skills during practice.

**Research Questions**

The following research questions guided this study:

1. What metacognitive habits do collegiate piano majors possess?
2. How do collegiate piano majors measure their own abilities against that of their peers?
3. How accurately do collegiate piano majors predict their own performance outcome? And how does this predictive accuracy correlate with self-reported metacognitive skills?
4. How accurately do collegiate piano majors self-evaluate following a performance? And how does this self-evaluation correlate with their actual performance evaluation?
5. In what ways do specific metacognitive habits correlate with performance ability?

**Methodology**

This study included a pretest questionnaire, a jury performance and evaluation, and post-performance self-evaluation. Participants (N = 12) in this study were collegiate piano majors enrolled in applied music lessons in the University of South Carolina
School of Music. Permission to administer the study was obtained from Dr. Joseph Rackers, Piano Area Coordinator in the University of South Carolina School of Music, and appropriate piano faculty. The requisite University of South Carolina Internal Review Board permission to administer the study was obtained. Participation in the study was voluntary and students were informed of the nature of the study and that it involved minimal risk. Consent from participants was obtained, anonymity was assured, and data collected from self-reported questionnaires and self-evaluative rubrics was maintained and stored on secure devices.

Limitations of the Study

This study was limited to an investigation of self-reported metacognitive habits among piano majors enrolled in degree programs at the University of South Carolina School of Music. Reference was made to related performance skills and to other areas of cognition, but the study was limited to an investigation of self-reported metacognitive skills as reported by subject volunteers participating in the study. Experts in the field of metacognition note that the primary challenge in assessing metacognition is that metacognitive skills are not directly observable (Sperling et al., 2002). Others add that self-reporting methods, such as use of questionnaires and rating scales, may disproportionately rely on one’s written descriptive abilities (Whitebread et al., 2009). Evaluation models were consulted to arrive at the most effective evaluation instrument possible for application in the study.
Review of Literature

This literature review comprises two parts: (1) an overview of metacognitive study in general domains and (2) metacognitive study in music research.\(^5\) Part one explores the history of metacognitive research, including subcomponents of cognitive knowledge and cognitive regulation together with essential constituencies of procedural and declarative knowledge, planning, monitoring, and evaluation. Part one also investigates cognitive constructs related to metacognition, such as critical and creative thinking, motivation, self-efficacy, and inhibitory control. It examines the development of metacognition among individuals, particularly in young children, offering viewpoints on teaching metacognition and discussing challenges in its analysis. Part two provides an overview of metacognitive study in music research, including an examination of metacognition in relation to self-reflection, self-regulation, and self-evaluation.

Part One: An Overview of Metacognition

In 1979, American developmental psychologist John H. Flavell introduced the term metacognition, describing it as “one’s own knowledge concerning one’s cognitive processes and products or anything related to them” (Flavell, 1979, p. 906). Flavell offered the following example:

I am engaging in metacognition (metamemory, metalearning, metaattention, metalanguage, or whatever) if I notice that I am having more trouble learning A than B, if it strikes me that I should double-check C before accepting it as a fact, if it occurs to me that I had better scrutinize each and every alternative in any multiple-choice-type task situation before deciding which is the best one, if I become aware that I am not sure what the experimenter really wants me to do, if I sense that I had better make a note of D because I may forget it, if I think to ask someone about

\(^5\) A research project initiated by Pearson Education, titled “Metacognition: A Literature Review,” served as an invaluable resource for this research (Lai, 2011).
E to see if I have it right. Such examples could be multiplied endlessly.

Metacognition refers, among other things, to the active monitoring and consequent regulation and orchestration of these processes in relation to the cognitive objects or data on which they bear, usually in the service of some concrete goal or objective (p. 232).

Costa described metacognition as “our ability to know what we know and what we don’t know. . . . our ability to plan a strategy for producing what information is needed, to be conscious of our own steps and strategies during the act of problem solving, and to reflect on and evaluate the productivity of our own thinking” (Costa, 1984, p. 57). Cross and Paris defined metacognition as “the knowledge and control [individuals] have over their own thinking and learning activities” (Cross and Paris, 1988, p. 131). Barell defined it as our “awareness of how we think about a certain task or problem” (Barell, 1988, p. 14-17) and Taylor described metacognition as “an appreciation of what one already knows, together with a correct apprehension of the learning task and what knowledge and skills it requires, combined with the agility to make correct inferences about how to apply one’s strategic knowledge to a particular situation, and to do so efficiently and reliably” (Taylor, 1999, p. 34). Martinez described it as “the monitoring and control of thought” (Martinez, 2006, p. 696). In its simplest form, metacognition refers to “cognition about cognition.” The root word “meta” means “beyond,” and “cognition” may be defined as “the act or process of knowing in the broadest sense” (Merriam-Webster, 2016). So, a transliteration of the word “metacognition” may be understood as meaning “beyond cognition” or “beyond thinking.”

The genesis of metacognition may be traced to the late-1970s during a time when educators determined that content-only driven instruction did not produce independent, effective thinkers (Presseisen, 1986; Halpern, 1998; Kuhn, 1999). Thus began an
emphasizes on teaching students thinking skills, such as critical, creative, and higher-order thinking. Presseisen believed metacognition to be the most striking aspect of training students in higher-order thinking, describing it as encompassing “the learning to learn skills aimed at making thinking more conscious and the student more aware of the ways one can go about problem solving or decision making” (Presseisen, 1986). Halpern (1998) also underscored the importance of metacognition in developing critical thinking skills, referencing such metacognitive actions as goal setting, evaluating accuracy, and monitoring time and energy spent in pursuit of goals. Similarly, Kuhn (1999) noted the significance of metacognition in connection to critical-thinking skills, suggesting that metacognition is implicit in all modes of critical thinking.

In theory, metacognition is domain transcendent; in application, it is domain-specific. Benton writes in Thinking about Thinking: Metacognition for Music Learning, “Learners do not practice metacognitive skills in isolation from the content of their studies” (Benton, 2014, p. 4). Instead, metacognition holds unique application to specific domains. Colwell (2011) agrees, asserting that critical thinking is linked to domain-specific content and skill. He contends, “What we do know about thinking is that it is subject matter-specific. Scholars think in a discipline: one thinks like a historian or like a musician. The process of thinking is intertwined with the content of thought–domain knowledge” (Colwell, 2011, p. 108). Others concur; Chiu and Kuo explain that metacognitive training must begin with domain-specific language because it helps individuals recognize prior knowledge, identify new information, integrate new learning, and distinguish errors (Chiu and Kuo, 2009). Benton provides an illustration of metacognition in the domain of music learning:
Music students learn how to count rhythm patterns within specific meters. With practice, they develop the ability to monitor their rhythmic accuracy, recognize rhythm mistakes, and apply strategies to correct those mistakes. . . . when music learners become aware that they have made rhythm mistakes—and they take action to make corrections—they are applying metacognition. Specifically, the learners are using the metacognitive skills of self-awareness, self-monitoring, and strategy use to accomplish the goal of rhythmic accuracy (Benton, 2014, p. 5).

Still, researchers recognize metacognition as partially domain-general (Gagne and Driscoll, 1988; Halpern, 1998). In particular, Gagne and Driscoll (1988) categorize metacognitive strategies of goal-setting, concentration, and self-monitoring as executive functions, meaning that they are necessary for the cognitive control of behavior. Other executive functions include inhibitory control, reasoning, problem solving, and working memory, among others. These skills develop throughout the lifetime of individuals and continually evolve based on life experiences, instruction, and training. In this context, Halpern (1998) categorizes metacognition as a “boss” function, enabling individuals to properly plan, monitor, and evaluate cognitive actions. Others view metacognition as the “central processor” of thinking (Brown, 1978, p. 81). Anderson et al. revised Bloom’s taxonomy, including metacognition as part of the “knowledge dimension.” They defined metacognitive knowledge as “knowledge of cognition in general as well as [an] awareness and knowledge of one’s own cognition” (Anderson et al., 2001).

Cognitive Knowledge and Cognitive Regulation

Researchers generally consider metacognition to comprise two parts: (1) Cognitive knowledge and (2) Cognitive regulation (Schraw, 1998, Cross and Paris, 1988, Flavell, 1979). Cognitive knowledge refers to what an individual knows about cognition and can be classified in three ways: (1) person variables; (2) task variables; and (3)
strategy variables. “Person” variables represent the knowledge about an individual’s own strengths and weaknesses as they pertain to learning and processing information. “Task” variables denote the awareness one has for evaluating the complexities of a task as well as the demands required to complete the task. Lastly, “strategy” variables signify the active methods one employs when encountering a learning or problem-solving situation. Livingston offers the example, “I know that I (person variable) have difficulty with word problems (task variable), so I will answer the computational problems first and save the word problems for last (strategy variable)” (Livingston, 1997).

Others categorize cognitive knowledge as either declarative or procedural knowledge (Kuhn, 2000; Schraw et al., 2006; Kuhn and Dean, 2004). Some describe declarative knowledge as epistemological understanding, meaning it refers to an individual’s general understanding of thinking and knowing (Kuhn and Dean, 2004). Schraw et al. (2006) interpret declarative knowledge as meaning knowledge about oneself as a performer and learner. The process of self-appraisal as described by Paris and Winograd (1990) reflects another viewpoint on declarative knowledge wherein individuals ask the question, “Do I know this?” Conversely, an awareness and management of cognition, primarily in regards to stratagem, demonstrate procedural knowledge (Kuhn and Dean, 2005; Schraw et al., 2006). Schraw et al. (2006) describe this emphasis on strategic knowledge as conditional cognitive knowledge and propose that children often exhibit its deficits. Furthermore, their research indicates that while this conditional knowledge improves with age, many adults find difficulty in articulating their knowledge; thus it can be considered implicit for some.
The second part of metacognition (cognitive regulation) includes elements of planning, monitoring, and evaluating (Cross and Paris, 1988; Paris and Winograd, 1990; Schraw and Moshman, 1995; Schraw et al., 2006). Planning is multifaceted, involving goal setting, allocation of resources, time management, as well as awareness and selection of learning strategies. Monitoring, which can be understood as regulating, includes attending to and being aware of comprehension and task performance. Effective monitoring often involves self-testing. Lastly, evaluation is described as the appraisal of one’s learning in regards to measuring its products against goals. Flavell (1979) uses the phrase “cognitive experiences” to describe cognitive monitoring; by this he refers to insights or perceptions that an individual experiences during cognition. For example, a perception such as, “I’m not understanding this,” can serve as an appraisal and thereby assist the learner in revising his or her goals.

Naturally, researchers have identified connections between cognitive knowledge and cognitive regulation. Both Schraw (1998) and Flavell (1979) assert that one enables the other, though each describes the experience somewhat differently. Schraw contends that cognitive knowledge facilitates cognitive regulation and quite similarly, Flavell (1979) reasons that cognitive regulation begets cognitive regulation. Moshman (1995) proposes that cognitive knowledge and cognitive regulation are integrated in metacognitive theories; namely, three theories – tacit, informal, and formal theories. Initially, tacit theories are constructed without explicit awareness derived from experiences or peers. Informal theories are “fragmentary,” meaning that individuals may be aware of certain aspects but not others.
Related Cognitive Constructs

Metacognition has been linked to other cognitive constructs, including critical thinking, motivation, and metamemory, for example. Schneider and Lockl (2002) described metamemory as “knowledge about memory processes and contents” and as constituting two segments: (1) variables, which closely mirrors declarative knowledge and refer to “explicit, conscious, factual knowledge that performance in a memory task is influenced by a number of different factors or variables,” (p.6) and (2) sensitivity, which corresponds to procedural knowledge and refers to the organization and selection of memory strategies.

Some researchers relate metacognition to critical thinking, in which similarities most commonly include components of argumentative analysis (Ennis, 1985; Paul, 1992), inductive or deductive reasoning (Willingham, 2007; Paul, 1992), judging or evaluating (Case, 2005; Ennis, 1985) and problem solving (Ennis, 1985; Willingham, 2007). Additionally, critical thinking involves dispositions, which may be certain attitudes or habits of mind that include inquisitiveness, flexibility, fair-mindedness, open-mindedness, and interest in knowledge, to name a few (Ennis, 1985; Paul, 1992). Research also indicates that there are general and domain-specific components of critical thinking (Ennis, 1989; Paul, 1992).

Flavell maintains that critical thinking should be included in the definition of metacognition, stating, “critical appraisal of message source, quality of appeal, and probable consequences needed to cope with these inputs sensibly [can lead to] wise and thoughtful life decisions” (Flavell, 1979, p. 910). Similarly, Martinez suggests that critical thinking is our “[evaluation of] ideas for their quality, especially judging whether
or not they make sense” (Martinez, 2006, p. 697). Martinez views critical thinking as one of three components of metacognition, the other two being metamemory and problem solving. Hennessey (1999) considers critical thinking to be included within the definition of metacognition, noting similar skills within each domain, such as evaluating one’s own beliefs, appraising one’s competing conceptions, considering the associations between one’s conceptions and substantiation that may or may not support those conceptions, and evaluating the consistency of one’s conceptions.

Others, however, such as Schraw et al., view metacognition and critical thinking as included in the definition for self-regulated learning, which they describe as “our ability to understand and control our learning environments” (Schraw et al., 2006, p. 111). In addition to metacognition and critical thinking, Schraw et al., also believe that self-regulation includes elements of motivation as inherently connected to self-appraisal and self-evaluation. Others agree, noting a natural link between metacognition and motivation (Cross and Paris, 1988; Martinez, 2006; Schraw et al., 2006).

Broussard and Garrison (2004) describe motivation as an element that “moves us to do or not to do something” (p. 106). Schraw et al. (2006) suggest that within the context of metacognition, motivation can be defined as “beliefs and attitudes that affect the use and development of cognitive and metacognitive skills” (p. 112). Martinez (2006) suggests that metacognitive strategies can improve determination and motivation when faced with challenging tasks. Similarly, Paris and Winograd (1990) propose that as one monitors and appraises their own cognition, they become increasingly aware of their own strengths and weaknesses.
Metacognitive Development

The Piagetian tradition has influenced many of those researching individuals’ metacognitive capacity (McLeod, 1997), leading some to conclude that young children are incapable of formal operation – abstract thought. Consequently, much of research into metacognitive capacities of young children concludes that metacognition is late developing (Flavell, 1979; Schraw and Moshman, 1995). In fact, conventional knowledge holds that children do not develop metacognitive skills before the ages of eight to ten (Whitebread et al., 2009). Flavell (1979) believes that young children struggle to appraise their abilities to identify what they do and do not comprehend or what they can and cannot memorize. Selecting appropriate learning strategies, known as planning, is also widely believed to be a late developing skill, ordinarily not appearing until between ages ten and fourteen.

Recent studies, however, have produced uncertainty regarding the conclusions of earlier research that metacognition is generally lacking from young children. Schraw and Moshman (1995) determined that children, by the age of four, are able to consider their own thinking and to employ simple strategies in self-regulated learning. Whitebread et al. (2009) found that children between the ages of three and five could verbalize metacognitive processes, including their knowledge, cognitive and emotional regulation. McLeod (1997) suggests that even preschool-aged children possess the abilities to plan and monitor progress as well as persist in spite of challenging tasks. Schraw and Moshman (1995) determined that children as young as age six can reflect with accuracy on their own cognition. Hennessey (1999) observed first-grade students evaluating the plausibility and credibility of their science conceptions.
Furthermore, Schneider (2008) investigated the relationship between theory of mind and subsequent development of metamemory among a group of 174 children whom he followed from the ages of three to five. Schneider describes theory of mind as one’s ability to “estimate mental states, such as beliefs, desires, or intentions, and to predict other people’s performance based on judgments of their mental states” (p. 115). Schneider (2008) also observed correlating theory of mind competencies and language development among those in his study, stating, “early [theory of mind] competencies can be considered as a precursor of subsequent metamemory” (p. 116).

Carlson and Moses (2001) determined that theory of mind abilities among young children might depend on their capacity for executive functioning. An interrelated term, executive functions are a set of cognitive processes that include working memory, cognitive flexibility, inhibitory control, problem solving, and planning, among others. In particular, inhibitory control refers to one’s ability “to inhibit responses to irrelevant stimuli while pursuing a cognitively represented goal” (p. 1033). Or, to put it differently, inhibitory control represents an individual’s ability to override habitual or dominant behavioral responses to a stimulus in order to implement more adaptive goal-oriented behaviors. Carlson and Moses investigated the relationship between inhibitory control and Theory of Mind among pre-school children, determining that the presence of executive functioning may be conditional for the development of metacognition. Studies assessing children’s inhibitory control have generally tested for delayed gratification and a child’s ability to suppress impulses. Carlson and Moses found that noticeable development of inhibitory control abilities occurs from ages three to six, in particular.
Schraw and Moshman (1995) conceived that the development of metacognition proceeds in the following way: first, children as young as age six acquire cognitive knowledge, which is one’s reflection on the accuracy of their thinking. Secondly, children from ages ten to fourteen begin developing skills of cognitive regulation, which manifests itself in skills of monitoring and planning. Evaluation of cognition typically follows in development after age fourteen and into adulthood, though it may remain incomplete in many adults. And finally, the ability to form metacognitive theories proceeds last, though sometimes not at all. Metacognitive theories help us reflect on our own thinking and learning; they tend to develop implicitly, without awareness, and eventually become explicitly structured over time.

Kuhn and Dean (2004) offered an epistemological viewpoint for the development of metacognition among children. Preschool children associate believing with knowing; they believe that others perceive the world as they do. This is known as realism. By age four, children learn that beliefs can be incorrect, known as absolutism. These children hold to the binary notion that one person is correct because the other is incorrect. By adolescence, individuals learn that even experts can disagree. In the extreme, this is referred to as multiplism or relativism, a position that maintains that all beliefs are subjective and that none can be judged. Lastly, by adulthood, we have learned to tolerate a certain degree of uncertainty and can comprehend that opinions may be better or worse depending on supporting evidence. According to Kuhn and Dean, individuals naturally develop through these four stages; however, the last stage necessitates instructional effort.
Schneider and Lockl (2002) proposed that the development of metacognition correlates to a child’s comprehension of a vocabulary that includes words such as “think,” “remember,” “know,” and “forget.” This growth typically begins around age four with the acquisition of memory verbs that describe particular mental states. Between the ages of six and eleven, children experience large gains in procedural metamemory knowledge; however, during this time some children are prone to over-estimate their memory performance. Generally, by ages nine and ten, children realize that memory performance is less linked to effort than to the use of learning strategies. And by age twelve, most children are able to distinguish between effective and ineffective memory strategies and from this age onward are able to criticize task characteristics, effort, and strategies.

Unsurprisingly, there is some evidence suggesting that metacognitive development does not necessarily continue with age. According to research conducted by Sperling et al. (2002) that assessed general metacognition among children in the third through eighth grades, mean scores of metacognitive skills remained the same as children aged. Sperling et al. (2002) speculated that perhaps domain-specific metacognitive skills increase as children acquire more specialized knowledge, but not general metacognition. Interestingly, self-reported metacognitive ratings that were compared to teachers’ ratings of students indicated a correlation between increasing age and weakening metacognitive awareness. Sperling et al. concluded that it is possible that younger children possess general metacognition whereas older children develop more domain-specific metacognitive skills.
Teaching Metacognition

Some researchers offer empirical evidence that metacognitive skills are “teachable” (Cross and Paris, 1988; Hennessey, 1999; Kramarski and Mevarech, 2003). Cross and Paris (1988) conducted research with students in the third and fifth grades, seeking to determine whether metacognitive skills and reading comprehension could be improved. Results indicated that children in both grades made gains in three areas – evaluation of task difficulty, planning, and monitoring progress.

Kuhn and Dean discussed the importance of bridging the gap between how educational practitioners and developmental psychologists approach the matter of developing thinking skills in students (Kuhn and Dean, 2004). They make claims for the necessity of providing teachers with mechanisms for fostering metacognition among their students. In agreement, Martinez describes the problem of teachers lacking an awareness of the multitudinous dimensions of metacognition and their significance in cultivating higher-level thinking. Martinez also pronounces the discovery of metacognitive disciplines a “major breakthrough” in educational and psychological research. Martinez offers a compact definition of metacognition – “the monitoring and control of thought” (Martinez, 2006, p. 696). He asserts the growing importance of metacognitive ability in an increasingly complex and information-rich world. Schneider (2008) of the University of Wuerzburg published research findings indicating that certain dimensions of declarative metacognition steadily improve throughout childhood and adolescence due to increases in knowledge but not similarly for procedural metacognition. Schneider also emphasized the significance of teachers’ responsibility for developing metacognition among students.
Dignath et al. (2008) examined forty-eight studies investigating the outcomes of instruction in self-regulation and use of learning strategies among first through sixth grade students. Results indicated that the most successful training strategies were combinations of planning and monitoring (mean effect size of 1.50) and planning and evaluation (mean effect size of 1.46). Interestingly, these combinations were more successful than concurrently teaching all three metacognitive skills of planning, monitoring, and evaluation or in teaching any cognitive strategies (i.e. organization, problem solving, and elaboration) in isolation.

Similarly, Haller et al. (1988) analyzed twenty empirical studies evaluating the effects of metacognitive training students’ metacognition during reading. Their analysis determined that instructional interventions consisting of at least ten minutes of training per lesson produced the best outcomes, and the most effective strategies included self-questioning and backward-forward search strategies. Hennessey (1999) discussed a three-year instructional structure for students in the first through sixth grades. The program consisted of explorations into students’ conceptions of the nature of science and its activities focused on developing metacognitive skills. Instructional methods aimed at helping students clarify their conceptions of science via small group discussion, promoting openness to conceptual conflicts, and encouraging metacognitive discourse. Empirical evidence showed that students demonstrated qualitative improvements to metacognition from year to year.

Lastly, Kramarski and Mevarech (2003) detailed the outcomes of a study involving 384 eighth-grade students in which interventions of metacognitive instruction sought to improve mathematical reasoning and metacognitive skills. Their report suggests
that students exposed to metacognitive training demonstrate gains in their abilities to interpret mathematical graphs, explain mathematical solutions, engage in logical discourse of mathematical reasoning, and express math concepts in multiple ways. Cross and Paris (1988) recommend using an explicit instructional approach to procedural, declarative, and conditional knowledge. Likewise, Schraw et al. (2006) suggested that educators provide explicit training in metacognitive and cognitive strategies. Schraw (1988) stressed the importance of strategy training, notably in regards to how, when, and why to use particular learning strategies.

Other researchers emphasize the importance of providing instruction in cognitive regulation (Kuhn, 2000; Schraw, 1998; Mevarech, 2003). Kuhn (2000) indicates that metacognitive instruction should be focused on meta-level awareness and control, as opposed to task-specific procedures. Schraw (1998) suggested providing students with checklists for planning, monitoring, and evaluating; here, the purpose is to help students develop strategies for effective problem solving. Comparably, Kramarski and Mevarech (2003) designed a study wherein students were given sets of metacognitive questions about comprehension, strategy, and connections, for use during tasks. The intent was to develop skills of reflection, problem solving through strategy, and recognition of task attributes.

Researchers also advocate the use of collective learning structures for encouraging metacognitive development (Cross and Paris, 1988; Hennessey, 1999; Kramarski and Mevarech, 2003; Kuhn and Dean, 2004; Martinez, 2006). Dillenbourg et al. (1996) referred to the importance of social interactions for supporting cognitive development as noted in Piagetian and Vygotskyian traditions. Piaget contended that
interaction with individuals of higher cognitive development provide instructional value as they cultivate cognitive conflict. Similarly, Vygotsky describes a zone of proximal development as “the distance between what an individual can accomplish alone and what he/she can accomplish with the help of a more capable peer or adult” (Dillenbourg et al., 1996).

Cross and Paris (1998) supported collaborative learning through group discussion about reading strategies. Hennessey (1999) recommended group discussion of reading strategies as well, noting that such methods promote metacognitive discourse and create cognitive conflict, which eventually leads to clarification of student beliefs and concepts. Kramarski and Mevarech (2003) highlighted that students working in cooperative settings benefit from higher quality discourse; they also observed that students participating in collaborate environments were able to express mathematical concepts in writing more capably than those working alone. Furthermore, Schraw and Moshman (1995) found that peer interactions could encourage the formation and improvement of metacognitive theories, which helps to integrate cognitive knowledge and regulation. Kuhn and Dean (2004) described how collaborative discourse can help students “interiorize” systems of conceptual description.

Schraw et al. (2006) recommend that social learning should include peers of same-level learning, because they can provide illustrations within the zone of proximal development. Lastly, Schraw (1998) suggests that teachers should model metacognition by thinking aloud, thereby modeling their process of task-description, problem solving, assessment, and reflection. Moreover, educators must not neglect the motivational components of metacognition, namely, self-efficacy and goal setting (Schraw, 1998).
Ultimately, Schraw notes that students with metacognitive awareness “have a greater sense of self-efficacy, attribute their success to controllable factors such as effort and strategy use, and persevere when faced with challenging circumstances” (Schraw, 1998, p. 122).

Metacognitive Assessment

According to Sperling et al. (2002), metacognitive assessment is challenging because metacognition is not directly observable. Whitebread et al. (2009) asserted that self-report methods such as questionnaires or rating scales that ask individuals to describe their thoughts, strategies, and reflections present difficulties because they rely heavily on descriptive ability. Moreover, systems of assessment that utilize “thinking aloud” capture only explicit metacognitive skills, not implicit ones. Particularly among pre-school and elementary students, whose working memory, verbal abilities, and vocabulary are still developing, methods of self-reporting tend to underestimate an individual’s metacognition. Irrespective of age and cognitive development, the intricacies of cognitive knowledge (declarative, procedural, conditional), cognitive regulation (planning, monitoring or regulating, and evaluating), as well as motivational concepts such as effortful control and inhibitory control, make metacognition unreliable and challenging in its assessment (Schraw and Moshman, 1995).

Self-report questionnaires and rating scales are other common methods for assessing metacognitive skills. Kramarski and Mevarech (2003) employed a metacognitive questionnaire, designed to assess general metacognition and also domain-specific skills – math strategies. Individuals were asked to indicate how often they use
particular strategies, using a Likert scale ranging from “never” to “always.” Moreover, Cross and Paris (1988) examined children’s metacognitive reading skills using a Reading Awareness Interview designed with 33 Likert-scaled items and 19 open-ended questions. The questions assessed three areas of reading awareness: (1) task difficulty evaluation and one’s own abilities, (2) planning and goal setting, and (3) progress monitoring.

Inventories provide an additional method of metacognitive assessment. Sperling et al. (2002) administered Junior Metacognitive Awareness Inventories to third through ninth grade students. Two versions of the inventory were distributed according to the age of students participating: Version A went to students in grades three through five and Version B was given to students in grades six through nine. Version A was a self-report inventory in which a three-point scale ranging from “never” to “always” was provided for twelve statements. Students responded to items such as, “I ask myself if I learned as much as I could have when I finish a task.” Version B contained a five-point Likert scale attached to eighteen statements of agreement or disagreement. Schraw and Moshman (1995) contended that verbal reporting methods of metacognitive assessment are effective because they permit access to elements of thinking that are not directly observable. Whitebread et al. (2009) suggested that observational approaches are helpful in assessing metacognition because they allow one to consider actual nonverbal behavior. Kramarski and Mevarech (2003) proposed using instructional tasks, thereby allowing participants the opportunity to identify and resolve conceptual conflicts.
Part Two: Metacognition in Music Research

Part two of the literature review explores specific metacognitive research in music teaching, learning, and performing. It begins with an overview of metacognition in music research and follows with an investigation of metacognition in relation to self-reflection, self-regulation, and self-evaluation. Carol W. Benton’s book *Thinking About Thinking: Metacognition for Music Learning* served as an invaluable resource for this portion of the literature review, providing vast amounts of credible analysis and historical background on the topic of metacognition in music research (Benton, 2014).

Since Flavell first introduced the notion of metacognition, the predominance of metacognitive research has been domain-transcendent, offering general principles of theory or application to fields of study unrelated to music. Often there has emerged relevant data for the music teacher, such as notions of self-knowledge, self-evaluation, planning, and monitoring. But there exists problems in translating conclusions about metacognition in the general sense into meaningful conclusions for the music teacher. Music learning involves more than cognitive knowledge, it also comprises skill development in psychomotor and affective domains. These complexities can result in challenges when transferring general information about metacognition into specific application for the piano teacher. Fortunately, music research into metacognition began more than three decades ago and has flourished in recent years.

In 1989, Pogonowski contributed a chapter to the MENC publication, *Dimensions of Musical Thinking*, devoted to metacognition. Pogonowski (1989) declared that metacognitive skills represented one of the four dimensions of musical thinking. She affirmed that metacognitive skills might assist music learners in controlling their own
learning processes, become more aware of their own skills, and free themselves from exclusively rote-based learning. Egan (1995) investigated the metacognitive effects on students in musicianship classes. In her study, students received instruction in applying metacognitive skills of monitoring and regulation to determine whether they were aural, kinesthetic, or visual learners. Using metacognitive skills of self-questioning and monitoring, students adjusted their learning strategies to the learning tasks in their musicianship class. Students were provided questions as prompts to guide self-reflection. In the end, Egan determined that participants in the study made meaningful gains in musicianship skills.

Sandra Mathias conducted an empirical study in 1997 on the effects of using metacognitive skills of self-assessment to improve vocal pitch-matching ability. Her study, which included having students play matching-games and then self-assess their accuracy, concluded that only forty-two percent of first graders self-assessed accurately and that sixty-two percent of third through fifth graders self-assessed accuracy (Mathias, 1997, p. 65). The same year, Darolyne Nelson (1997) led a study investigating metacognition as a self-regulatory skill among male students in a choral music program. The goal of Nelson’s research was to explore methods of increasing self-efficacy among at-risk adolescent male students. As part of the study, participating choral directors promoted higher-order thinking through questioning techniques, requiring students to answer questions such as “How do you know that?” Students were challenged to not simply sing, but to think before and while singing. Nelson concluded that students made noticeable gains in vocal-performance efficacy.
In 2001, Susan Hallam compared the habits of novice and expert musicians to determine the degree to which each group utilized metacognitive skills in music learning. Hallam (2001) found, not surprisingly, that expert musicians used metacognition to a greater degree in practicing and performing than did novice musicians. She noted that professional musicians “learn to learn,” specifically in identifying personal strengths and weaknesses, assessing the difficulty of repertoire, and planning and applying practice strategies for ideal performance. Hallam summarized, saying,

A musician requires considerable metacognitive skills in order to be able to recognize the nature and requirements of a particular task; to identify particular difficulties; to have knowledge of a range of strategies for dealing with these problems; to know which strategy is appropriate for tackling each task; to monitor progress towards the goal and, if progress is unsatisfactory, acknowledge this and draw on alternative strategies; to evaluate learning outcomes in performance contexts and take action as necessary to improve performance in the future (Hallam, 2001, p. 28).

In a follow-up to the 1989 book, Dimensions of Musical Learning and Teaching: A Different Kind of Classroom, metacognition was once again cited as an essential type of thinking in music learning. In this 2002 release, editor Eunice Boardman urged music educators to share information about critical and creative thinking, decision making, and problem solving skills with their students. Boardman contends that metacognitive processes will develop in students to the extent that music teachers cultivate them (Boardman, 2002, p. 18).

Welsbacher and Bernstorf (2002) warned against over-emphasizing the necessity of metacognitive skill acquisition among students with disabilities or cultural disadvantages. Welsbacher and Bernstorf determined that students with special needs may be incapable of acquiring certain metacognitive skills, such as cognitive awareness and self-monitoring, because of cognitive-processing overload.
Edward Lisk, author of *The Creative Director: Conductor, Teacher, Leader* argued for what he called the A.R.T. system (alternative rehearsal techniques). Lisk said, “A.R.T. is a new dimension in teaching, thinking, practicing, and playing an instrument. It is a departure from traditional instrumental techniques…” (Lisk, 2006, p. 313) Here, Lisk promoted the use of teaching metacognition to instrumentalists during rehearsal, explaining that, “by actively engaging their musical minds we develop their performance skills and teach them to make intelligent musical decisions through which they will more fully experience the entire world of musical masterworks.”

Scott (2006) claimed that metacognition was essential to a constructivist’s approach to music teaching.⁶ Scott’s study concluded that metacognition plays a role in enabling students to construct musical understanding from their experiences, which leads to reflective thinking and problem solving. In 2001, a revision of Bloom’s taxonomy included an emphasis on metacognition as one of four major types of knowledge. Bloom’s taxonomy includes three domains: (1) cognitive, (2) affective, and (3) psychomotor. Within the original cognitive domain were four learning objectives: (1) applying, (2) analyzing, (3) synthesizing, and (4) evaluating. Under the present revision, there are now six: (1) remember, (2) understand, (3) apply, (4) analyze, (5) evaluate, and (6) create. Regarding the revision and music learning, Wendell Hanna (2007) summarized,

In music learning, a key aspect of metacognition is strategic knowledge, which is vital to musical refinement. The ability to skillfully interpret music demands a high degree of self-knowledge. For example, many strategies that are formed during the development of musicianship are idiosyncratic and private; only the individual musician is privy to which strategies work for him or her. . . . Developing metacognition can help

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⁶ Constructivism refers to a theory of learning in which individuals construct their own understanding and knowledge of the world through experience and subsequent reflection (Scott, 2006).
music learners to become more objective about their overall musicianship. If learners lack metacognition – that is, if learners are not able “to think about musical thinking” – their musicianship will plateau and fail to progress (Hanna, 2007, p. 33).

McPhail (2010) conducted research in 2010 examining the effects of metacognitive skills among private violin students. McPhail required participants to monitor their learning processes, recognize errors, identify and develop strategies to solve problems. He engaged students in metacognitive activities during lessons by encouraging student self-reflection and -evaluation as well as self-awareness of personal strengths and weaknesses. McPhail determined that the use of metacognitive skills produced a positive effect on students’ progress.

Scott (2006) categorized what she describes as “minds-on” and “minds-off” learning within the music classroom. Scott, an advocate for the use of music student-activities that include self-reflection through journaling, self-assessment, self-strategizing towards learning goals, and interaction with learning peers, states the following about minds-on metacognitive teaching and learning strategies, “Students actively construct musical knowledge for themselves by thinking about what they are currently doing in relation to what they already know” (p. 17). Conversely, Scott contended that minds-off learning occurs as students passively accept information provided by others without evaluation and generally complete tasks without conscious awareness. In this framework, minds-on learning and teaching may produce a richer learning environment.

Self-Regulation in Music Learning

Self-regulation comprises an awareness of one’s own strengths and weaknesses, problem solving, and strategy use. Research indicates that self-regulative skills appear to
exponentially increase with skill development among musicians (Hallam, 1997, p. 93). For musicians to self-regulate, four elements of metacognitive knowledge must be present: (1) self-awareness, (2) declarative knowledge, (3) procedural knowledge, and (4) conditional knowledge. The first (self-awareness) refers to the activity of reflecting upon what one is thinking and doing. The second (declarative knowledge) denotes one’s awareness of strengths and weaknesses relating to learning tasks. This includes an awareness of what one already knows and what one needs to learn. The third element (procedural knowledge) describes an awareness of procedures, or strategies, necessary to accomplish a task or achieve a goal. The fourth, and last, element (conditional knowledge) concerns the effective implementation of procedures or strategies (Schraw et al., 2006, p. 114). These four elements of metacognitive knowledge (self-awareness, declarative, procedural, conditional) constitute the first half of metacognition, known as cognitive knowledge, and allow the learner to begin engaging in the other half of metacognition—self-regulation.

In 1989, Miklaszewski conducted a case study of a young pianist who would later become a concert pianist, seeking to determine what metacognitive skills he employed during practice. Results indicated that this student exhibited mastery of domain-specific metacognitive skills, including drilling small sections of music, alternation of fast and slow tempi within sections of music, making written notes in the score, and piecing together larger sections of music after drilling smaller units. Miklaszewski concluded that these practice strategies were subsumed within general metacognitive categories of self-awareness, monitoring, and self-evaluation (Miklaszewski, 1989, p. 95).
In a case study from 1997, Nielsen examined the practice habits of an organ student preparing for a performance. Nielsen recorded the student’s practice sessions, including verbal reports and comments made during practice. The practice reports pointed to the use of metacognitive skills in recognizing technical problems as they occurred and applying corrective strategies as necessary (Nielsen, 1997, p. 109). Nielson concluded that the student possessed a self-awareness of his own strengths and weaknesses as measured against skills necessary for a successful performance and applied corrective strategies to toward the goal of completing a successful performance.

In 2001, McPherson and Renwick conducted research investigating the self-regulative habits of beginning band students. They examined six dimensions of self-regulatory behavior: (1) motive—feelings of capability and interest in practice, (2) method—determining and applying practice strategies, (3) practice time management, (4) performance outcomes—monitoring and evaluation, (5) structuring the practice environment, (6) social factors—the activity of seeking information from peers, teachers, books, etc. McPherson and Renwick found these self-regulatory characteristics among many of the young, beginning band students, and among those employing these habits were higher-achievement in music learning (McPherson and Renwick, 2001, p. 170).

Byo and Cassidy (2008) studied the practice habits of college music majors, finding that self-regulatory skills assisted students in structuring practice sessions. They determined that for maximum practice effectiveness, students needed to be self-aware of their own strengths and weaknesses in comparison with the difficulty of repertoire to be learned. They noted that self-regulation may be defined as a cyclic process of self-monitoring, self-evaluating, and adaptive behavior towards the achievement of a goal,
and perhaps more importantly, concluded that “metacognition and self-regulation acknowledge the conditional, not fixed, nature of practice and are evident in the practice of advanced and novice performers” (p. 34). Leon-Guerrero (2008) determined that the self-regulatory behaviors of middle school band students occurred in three categories: (1) problem recognition, (2) strategy selection, and (3) evaluation of performance. She concluded that the metacognitive habits of these middle school musicians were similar to those of expert musicians, as defined as (1) planning, (2) identifying problems, (3) devising and applying strategies to correct problems, and (4) self-evaluation during practice.

In 2012, Miksza developed a test to measure the dimensions of self-regulation among music students. Developed from previous research in 2001 in which McPherson and Zimmerman determined six dimension of self-regulation (motive, method, time, performance outcomes, physical environment, and social factors), Miksza determined evidence of predictive validity. He contends that this measurement may prove useful in identifying the use of self-regulation in independent music practice (Miksza, 2012, p. 320).

Self-Reflection in Music Learning

Self-reflection may be characterized as the active process of mentally revisiting past learning experiences. Kerka (2006) describes five steps in reflective thinking: (1) the descriptive step in which one recognizes the completion of a learning event, (2) the metacognitive step wherein one examines the thought processes used to complete the event, (3) the analytic step in which the learner considers what happened when learning
and why, (4) the evaluative step wherein one determines the outcome quality of the learning process, and (5) the reconstructive step in which one considers improving future learning experiences (pp. 21–22). Research indicates that expert musicians instinctively engage in self-reflection, whereas novice musicians require teacher guidance and structure in order to undertake reflective thinking.

Results from a study conducted in 1990 indicated that production of music should not be the single focus of music learning in a performance ensemble; rather, musicians ought to devote time to perception and reflection for “significant learning” (Davidson and Scripp, 1990, p. 51). Researchers Davidson and Scripp directed an investigative study in association with Harvard Project Zero, intended to develop metacognitive skills of self-reflection, and by extension self-awareness, in high school band students. Their study involved the development of an Ensemble Critique Form, which aided students in reflecting on their progress as individual musicians and as an ensemble.

In 2002 and 2005, Hewitt identified self-reflection as inter-related to self-evaluation for successful music learning. In two studies involving students from middle school and high school instrumental ensembles, Hewitt recognized self-reflection as the final phase of self-regulation, and noted that self-reflection contained two parts: (1) self-judgment and (2) self-reaction (Hewitt, 2002, p. 216; Hewitt, 2005, p. 149). In 2008, Bauer conducted an investigative study in which middle school band students discussed and wrote reflections after playing repertoire or after listening to a recording of their playing (Bauer, 2008). Using the ensemble-critique form developed by Davidson and Scripp, Bauer implemented his study among 106 middle school band students over the course of six weeks. Participants used the Ensemble Critique Form once each week.
throughout the study. Results of the study indicated that students improved their ability to identify and solve performance problems. Bauer also noted that student practice time increased.

Research conducted in 2011 found that fifth graders in general music classes who received instruction in critical thinking developed skills of self-reflection. Johnson’s (2011) research substantiated claims that metacognitive skills could be taught; and further, it provided evidence that metacognitive training could improve the music learner’s experience (p. 266). Robinson, Bell, and Pogonowski (2011) developed an instructional model, called the Creative-Music Strategy, intended to guide “general-music students through the concepts of improvisation and composition, followed by critical reflection” (pp. 50–51). It functioned by providing teachers with tools for asking open-ended questions, specifically, in which step seven, “reflective analysis,” calls students to engage in higher-order thinking skills of reflection upon the past experience and planning for the next one.

Self-Evaluation in Music Learning

Music students receive routine evaluation from teachers; this feedback is often continuous and is rooted in the structure of private and group music instruction. Self-evaluation, which may also be identified as self-assessment, is a natural result of self-reflective thinking and characterizes a judgment of one’s practice or performance outcome. Self-evaluation may take place during or after the completion of a task. Research indicates that students do not engage in meaningful self-evaluation when teacher guidance or structure is not provided. In fact, studies suggest that students must
receive instruction in developing self-evaluative habits for beneficial self-evaluation to occur. Model audio and video recordings equally serve to improve self-evaluative skills, and students showed self-evaluative improvements when given a rubric, rating sheet, or checklist for use in self-evaluation. Without objective measures against which to self-evaluate and without teacher guidance, students repeatedly failed to accurately self-evaluate.

Davidson and Scripp (1990) conducted an investigative study into the effects of self-reflective writing and thinking among middle school band students. In this study, band directors provided students with an Ensemble Critique Form and designated time during rehearsals for students to complete the forms. Preparation for the study included band directors defining relevant musical terms and discussing matters related to self-reflection. The critique form included a section in which students reflected upon specific musical dimensions, such as rhythm, intonation, tone, balance, articulation, phrasing, and interpretation, as well as an area for students to write suggestions for methods of improvement and error-correction for their section and for the entire ensemble. Davidson and Scripp found that reflective thinking improved self-direction and independence among students (p. 60).

In an exploratory study from 1993, Bergee found that self-evaluations made by collegiate brass players did not correlate with evaluations made by peers and faculty. Bergee concluded that students must be given more in depth training into specifics and structure of self-evaluation (Bergee, 1993, p. 20). In a 1995 study among middle school instrumentalists, Aitchison investigated the effects of self-evaluation on music performance, motivation and self-esteem. Self-evaluation was studied according to four
modes: (1) teacher-only evaluation, (2) teacher-driven self-evaluation with student involvement, (3) student-driven evaluation with teacher assistance, and (4) student-only self-evaluation. Results indicated that student-only self-evaluation was unbeneficial, leading Aitchison to remark, “the lack of teacher guidance in the focusing of critical reflection likely hindered the ability of students to identify musical problems and self-administer appropriate diagnostic feedback” (Aitchison, 1995, p. 122-123). Unsurprisingly, teacher-only evaluation lead to immediate positive change, however, the effects were not always long-lasting. Concerning matters of motivation, Aitchison’s research determined that when students did not engage in self-evaluation, they were less motivated to continue working on improvement over time. Aitchison concluded that students preferred to participate in shared evaluation with teacher guidance or involvement.

Kostka conducted an investigative study in 1997 in which college pianists self-evaluated using five criteria: (1) hand position, (2) correct fingering, (3) technique, (4) sight-reading, and (5) musicality. Kostka compared student self-evaluations with teacher evaluations of student performances, revealing little agreement among student and teacher evaluations. Kostka concluded that for students to more accurately self-evaluate, teachers must teach students to self-evaluate, including, for example, training students to use objective criteria such as the five dimensions included in this study (Kostka, 1997, p. 275).

In 2001, Hewitt examined the capabilities of junior high school band students to improve their self-evaluative skills based on using an exemplary model. Hewitt found it beneficial to use a model recording against which students could make self-evaluations.
Results indicated that who self-evaluated after listening to a model recording scored higher in performance evaluations in areas of rhythm, interpretation, technique, and overall performance; however, certain performance elements were not achieved for students who only listened to model recordings but did not engage in self-evaluation (Hewitt, 2001, p. 318-19).

Researchers at an Australian University studied the effects of using metacognitive skills to engage in self-evaluation. Daniel (2001) videotaped students’ performances during concert practice classes; then, following class, students viewed their performance and wrote a three-hundred-word essay in critical self-reflection. Teachers provided the following outline for self-evaluations:

1. Personal presentation—entrance and exit, bowing, mannerisms, etc.
2. Musical issues—accuracy, repertoire choice, stylistic appropriateness, etc.
3. Overall impression—personal and audience response
4. Reflections on actual performance in comparison to perceived performance
5. Reflections on progress—improvements and developments since previous performance
6. Directions—plans to improve and enhance performance.

Students used metacognitive skills as they reflected upon their performance. Daniel concluded that the practice of videotaping students’ performances and requiring students to self-reflect upon the performance was beneficial to music student development and improvement. Daniel remarked that the practice of critical self-reflection was useful for students as they prepare to be teachers and also as they prepare to self-evaluate as future professional performers (Daniel, 2001, p. 219).
Bergee and Cecconi-Roberts (2002) conducted research among college instrumentalists, finding that teacher involvement was necessary in guiding student self-evaluation and that agreement was lacking between student self-evaluation and teacher or peer evaluation. Results of their study also indicated that inflated peer evaluation might lead to inflated self-evaluation. Bergee and Cecconi-Roberts found that having students listen to themselves using digital audio recordings was equally as effective in self-evaluation as having students watch their recorded performances using videotapes (Bergee and Cecconi-Roberts, 2002, p. 266).

In a study involving junior high band students, researcher Hewitt (2002) created a self-guided form for student self-evaluation using a woodwind and brass solo evaluation form developed by Saunders and Holahan. Students in Hewitt’s research utilized the form independently in conjunction with using model audio recordings to help guide self-evaluation. Results indicated that students evaluated their performance more highly than did their teachers and that without teacher-guidance student self-evaluation did not improve over time. Hewitt concluded that it may be helpful for teachers to provide systematic and ongoing instruction in self-evaluation (Hewitt, 2002, p. 218).

Morrison, Montemayor, and Wiltshire (2011) studied the use of recorded models for improving self-evaluation accuracy among middle and high school instrumentalists. Their research indicated that students were able to develop an awareness of their own deficiencies when self-evaluating against a recorded model. They concluded, “the presence of a model . . . may have allowed students to maintain a more consistent or objective perspective according to which they measured their progress” (p. 126).
In study of the practice habits of beginning, advanced, and professional pianists, Gruson (1988) observed that advanced and professional pianists employed more cognitively complex practice strategies. Moreover, Gruson noted that advanced and professional pianists transitioned from controlled cognitive processing to automaticity as they developed expertise. She remarked

Musical practicing may be viewed as a sequence of transition from controlled to automatic processing in which larger and larger chunks of musical information are built up from more-basic subcomponents. The novice student might be expected to focus [on] associating individual notes in the printed score with the corresponding positions on the musical instrument by means of controlled processing. With practice the associations between printed notes and manual positions become automatized and attention may be focused [on] more complex musical patterns such as chords, measures and ultimately phrases and larger units, which may, in turn come to be executed automatically from a single glance at the score (Gruson, 1988, p. 106).

Barry (1994) investigated the efforts of structured and strategic practicing on performance achievement. Barry’s experimental study, which included fifty-five brass and woodwind players in grades seven through ten, concluded that “a highly organized and systematic regimen of supervised practice incorporating slow rehearsal, mental practice, distributed practice, and goal setting is an efficient and effective means of improving musical performance” (p. 47). Participants were divided into two groups: (1) those who practiced independently for a set amount of time with supervision of adult monitors and with a structured agenda of practice strategies and (2) those who practiced independently for a set amount of time without supervision and who were free to plan their own practice strategies. Results indicated that in areas of musicality, melodic and rhythmic accuracy, students in the supervised and structured group out performed those in the unsupervised group.
In a survey of music teachers’ instructions for students regarding at-home-practice strategies, Barry and McArthur (1994) found that most of the teachers reported “always” or “almost always” discussing practice strategies with their students during lessons (p. 47). Again in 1994, researchers conducted an investigative study into the effects of mindfulness during independent practice on musicianship, strategy use, and technical proficiency. Cantwell and Millard (1994) studied instrumental students in the eighth grade, classifying students according to their responses to a Biggs’s Learning-Process questionnaire as either “deep” or “surface” learners. Cantwell and Millard (1994) defined deep learners as those who demonstrate greater strategy use and independence when learning and surface learners as those who learn more by rote and depend on teacher influence. They found that surface learners rarely practiced to attain musical skills beyond technical fluency, whereas deep learners regularly pursued the attainment of musical expression and interpretation in practice (p. 45).

In a study of practice habits among instrumental students, researchers identified a correlation between deliberate practice and those who attain music-performance goals. In this research, Sloboda, Davidson, Howe, and Moore (1996) expressed deliberate practice as marked by self-monitoring and strategy use; it is effortful and structured (p. 291). Moreover, Hallam compared the practice habits of expert (professional) and novice (student) musicians in a 1997 investigative study. In her research, Hallam (1997) remarked, “Practice is essentially a problem-solving activity,” which requires a high-degree of self-monitoring and self-evaluation (pp. 91–92). Hallam observed that expert (professional) musicians utilize metacognitive skills when practicing, including planning, self-monitoring, and strategy use. Perhaps most importantly, she noted that expert
musicians are aware of their own strengths and weaknesses and that this knowledge informs their process of self-regulation. Consequently, Hallam advocates for the intentional and explicit instruction of metacognitive skills and practice strategy, asserting that without this training, students lack essential tools for music learning.

McPherson (1997) investigated the metacognitive skills of instrumental students through interviews, asking students to explain their process of performance preparation. In this study from 1997, McPherson found that “the best musicians . . . possessed a rich repertoire of strategies which they used when preparing to perform” (p. 65). Not surprisingly, results of the study indicated that those who performed the poorest displayed the least knowledge of practice strategy use. In a study of college pianists’ engagement in practice strategy use prior to a performance examination, McPherson and McCormick (1999) found once again that higher-achieving students utilize more cognitive strategies than do poorer performing students. This study indicated that higher-achieving students engaged in self-regulation, mental rehearsing, and also spent more time practicing than did poorer achieving students (p. 172-73).

In a study of the practice habits of beginning instrumental students, Pitts, Davidson, and McPherson (2000) revealed that beginners demonstrated little knowledge or use of practice strategies. In fact, researchers found that students relied almost exclusively on repetition during their practice and that this repetition usually lacked self-monitoring and purpose (p. 45-46). Researchers advised teachers to spend lesson time instructing and modeling practice strategies for students. They also suggested that students review previously learned repertoire for the purpose of building performance confidence as well as technical and musical fluency.
In a 2001, Hallam (2001) concluded “the effective use of practice-strategies depends to some extent on the development of expertise” (p. 200). Hallam’s study, which included fifty-five string players from ages six through eighteen, found that without sufficient musical understanding, knowledge of practice strategies may be of little use. Rohwer and Polk (2001) studied the practice habits of eighth-grade instrumental students, placing the sixty-five participants within four categories: (1) holistic, non-corrective practicers, (2) holistic, corrective practicers, (3) analytic, reactive practicers, and (4) analytic, proactive practicers (pp. 172–173). Researchers found that nearly half of the students matched the holistic description and the other half fit the analytic categories. The results of the study were as follows:

1. Holistic, non-practicers mostly played-through repertoire without stopping to problem-solve. As a group, they achieved the poorest performance results in the study.

2. Holistic, corrective-practicers mostly played through repertoire and also stopped to fix errors as they were detected. As a group, these students received the second poorest performance results.

3. Analytic, reactive practicers focused on giving attention to repeating difficult passages within the context of playing through repertoire. These students achieved the highest performance results.

4. Analytic, proactive practicers mostly began by practicing difficult passages outside the context of playing through repertoire.

Based on the results of a 2008 case study among college music students, Byo and Cassidy (2008) concluded that strategic practice behaviors were potentially ineffective if
not accompanied by metacognitive thinking. Researchers acknowledged the essential influence of metacognition in deliberate practice. An investigative study in 2009 determined that a practice strategy based on error-correction was a greater predictor of performance success than amount of time spent practicing. The researchers, Duke, Simmons, and Cash (2009), studied advanced undergraduate and graduate piano majors, finding that error-detection and correction was the practice skill most determinant of successful performing and learning.

Summary

Metacognitive skills are essential to successful musical development (Scott, 2006; Hallam, 1997; Scrav et al., 2006; Miklaszewski, 1989; Nielsen, 1997; McPherson, 2001; Byo and Cassidy, 2008; Miksza, 2012; Kerka, 2006; Davidson and Scripp, 1990). Costa (1984) defined metacognition as “our ability to know what we know and what we don’t know” (p. 57). Metacognition represents one’s ability to form strategies when approaching a learning task, to consciously attend to strategic steps when problem solving, and to reflect on and evaluate the results of one’s own thinking (Costa, 1984). Research indicates that metacognition is present in children as young as age 4 (Schraw and Moschman, 1995) and that it can develop implicitly, without awareness, as well as explicitly throughout childhood, adolescence, and adulthood (Kuhn and Dean, 2004). Researchers believe metacognition is teachable (Cross and Paris, 1988; Hennessey, 1999; Kuhn and Dean, 2004; Boardman, 2002) and holds unique application to specific domains of study (Colwell, 2011; Chiu and Kuo, 2009; Benton, 2014).
Metacognitive research among musicians has primarily focused on pre-college general music classes (Johnson, 2011; Robinson, Bell, Pogonowski, 2011; Mathias, 1997) and middle school and high school instrumental ensembles (Hewitt, 2002; Bauer, 2008; McPherson and Renwick, 2001; David and Scripp, 1990; Aitchison, 1995; Morrison, Montemayor, and Wiltshire, 2011). Research shows that metacognitive engagement enables musicians to more effectively conceive, implement, and monitor learning strategies, as well as to more accurately self-evaluate following a performance (Scott, 2006; Hallam, 1997; Scraw et al., 2006; Miklaszewski, 1989; Nielsen, 1997; McPherson, 2001; Byo and Cassidy, 2008; Miksza, 2012; Kerka, 2006; Davidson and Scripp, 1990). Because metacognition is recognized as essential to effective music practicing, learning, and performing (Hallam, 2001; Boradman, 2002; Hanna, 2007; McPhail, 2010; Benton, 2014), music researchers have argued for including metacognitive study in classroom and in private lessons (Lisk, 2006; Boardman, 2002; Pognowski, 1989; Hanna, 2007). And so, in this study, the researcher sought to measure metacognitive skills among collegiate piano majors.
CHAPTER 2

METHODOLOGY

The purpose of this study was to measure self-reported metacognitive habits among collegiate piano majors. It examined the degree to which participants comprehend and employ practice strategies, recognize their own strengths and weaknesses in learning and performing, accurately predict a performance outcome, and self-evaluate following a performance. This chapter includes information regarding the research setting and participants, as well as the procedures and methods of data collection and analysis used to achieve the purposes of the study.

Setting

This study occurred on Wednesday and Thursday, April 26 and 27, 2017 at the University of South Carolina’s School of Music, located in Columbia, South Carolina. The study included a pretest questionnaire, a jury performance and evaluation, and a post-performance self-evaluation. Firstly, participants completed a pretest questionnaire at a table located outside the School of Music Recital Hall. Secondly, participants performed their jury examination in the School of Music Recital Hall while an observing faculty member completed an evaluation form for each participant. Thirdly and finally, participants completed a post-performance self-evaluation form outside the School of Music Recital Hall upon the conclusion of their jury performance.
Students enrolled in applied piano lessons at the University of South Carolina School of Music perform jury examinations at the conclusion of each semester. Jury examinations consist of a ten-minute performance of solo and/or concerto repertoire and sight-reading. Sophomore piano majors perform a 30-minute barrier-jury consisting of repertoire, sight-reading, and technical requirements. Juries are held during the final week of classes each semester. Jury performances are evaluated by University of South Carolina School of Music piano faculty.

**Participants**

A total of 12 collegiate pianists (N = 12), including 6 undergraduate and 6 graduate students, participated in this study; all participants were registered for applied piano lessons as piano majors at the University of South Carolina School of Music. Participants were enrolled in a variety of undergraduate and graduate degree programs within the School of Music, including the Bachelor of Music-Education (n = 2), Bachelor
of Music-Performance (n = 1), Bachelor of Arts in Music (n = 3), Master of Music-Performance (n = 3), and Master of Music-Pedagogy (n = 3). In compliance with the Institutional Review Board (IRB) at the University of South Carolina, this study was submitted for review and approved as exempt (See Appendix A). Each participant signed a letter of consent in agreement to participate in the study (See Appendix B).\footnote{Doctoral students at the University of South Carolina did not meet eligibility requirements for this study because doctoral piano majors are not required to perform juries after their first semester of study. Rather, doctoral pedagogy students perform a 30-minute candidacy hearing and doctoral performance students perform a 50-minute recital during the second semester of their study.}

![Participant Degree Programs](image)

\textit{Figure 2.2.} Participant Degree Programs (N = 12).

**Materials**

The researcher used two forms of data collection in this study: (1) a researcher-constructed pretest questionnaire, and (2) a researcher-constructed evaluation form. The pretest questionnaire was administered before participants’ jury performances and the evaluation form was used on two occasions: first by a piano faculty member during jury performances and secondly by participants following their own jury performance.
The pretest questionnaire was divided into three parts: (1) general information, (2) metacognition, and (3) practice methods (See Appendix C). The first part—general information—gathered information about participant’s degree program and classification, years having played the piano, years having taken formal piano lessons, average days of weekly practice, and average hours of daily practice. The general information section also asked participants to predict their evaluation score out of a possible 32 points and to compare their predictive score with other participants’ scores via percentile. The second part—metacognition—contained 20 statements designed to measure participants’ views of their own practice and performance skills. Using a 5-point Likert scale along a continuum from “Strongly Disagree” to “Strongly Agree,” statements comprised equal-parts positive and negative positions. The third part—practice methods—including space for participants to describe three methods of learning used during practice.

The actual evaluation and self-evaluation forms were identical. They contained eight areas of critique: (1) Memory Control, (2) Note Accuracy, (3) Tempo Control, (4) Rhythmic Accuracy, (5) Articulation Accuracy, (6) Dynamic Accuracy, (7) Tone Quality, and (8) Expressivity. Participants responded using a 4-point scale in which 1=Poor, 2=Fair, 3=Good, and 4=Excellent. The maximum points possible was 32.

Procedures

The researcher requested permission from University of South Carolina School of Music piano faculty to invite piano majors to participate in this study. Eligible piano majors included those performing piano juries at the conclusion of the semester. With permission, the researcher contacted twenty-one eligible students by email, informing
them of the study and inviting them to participate. Twelve students agreed to participate—6 undergraduate and 6 graduate.

Piano juries were scheduled for Wednesday and Thursday, April 26 and 27, 2017 in the University of South Carolina School of Music Recital Hall. Prior to each participant’s piano jury performance, the researcher administered pretest questionnaires and collected consent forms from participants. Evaluation forms were delivered to University of South Carolina School of Music piano faculty prior to each participant’s jury performance. Faculty evaluators were not the participant’s applied piano teacher. Upon the completion of each participant’s jury performance, the researcher distributed a self-evaluation form to each participant. At the conclusion of the piano juries, the researcher collected actual evaluation forms for each participant.

Analysis of Data

To statistically address the research questions presented in Chapter 1, the researcher entered data into IBM SPSS Statistical software to identify descriptive statistics for the data and the Pearson product-moment correlation coefficient to examine relationships among data. The researcher used testing results to answer the following research questions:

1. What metacognitive habits do collegiate piano majors possess?

2. How do collegiate piano majors measure their own abilities against that of their peers?
3. How accurately do collegiate piano majors predict their own performance outcome? And how does this predictive accuracy correlate with self-reported metacognitive skills?

4. How accurately do collegiate piano majors self-evaluate following a performance? And how does this self-evaluation correlate with their actual performance evaluation?

5. In what ways do specific metacognitive habits correlate with performance ability?
CHAPTER 3

RESULTS

This chapter includes findings from the study as reported in two parts: (1) descriptive statistics for the pretest questionnaire, actual evaluation and self-evaluation forms and (2) correlative statistics using the Pearson product-moment correlation coefficient. In review, the purpose of this study was to investigate the self-reported metacognitive habits among collegiate piano majors. A total of 12 collegiate pianists (N = 12), including 6 undergraduate and 6 graduate students, enrolled in applied lessons at the University of South Carolina School of Music volunteered to participate in this quantitative study. Participants completed a pretest questionnaire assessing their own metacognition, performed a jury examination, which included actual-evaluation from a piano faculty, and completed a self-evaluation form following their own jury performance.

Descriptive Statistics

The pretest questionnaire (See Appendix D) was designed to gather data in three parts: (1) general information, (2) metacognition, and (3) practice methods. Part one of the pretest questionnaire collected information about participants’ classification and degree program, number of years having played the piano, number of years having taken formal piano lessons, average number of days they had practiced each week, average
number of minutes they had practiced each day, predictive evaluation scoring for their upcoming jury performance, and predictive percentile ranking of their actual evaluation score in relation to predictive scores of other participants.

Table 3.1

Descriptive Statistics for Part One of the Pretest Questionnaire

<table>
<thead>
<tr>
<th></th>
<th>Min.</th>
<th>Max.</th>
<th>$\bar{M}$</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years Playing the Piano</td>
<td>10</td>
<td>20</td>
<td>14.16</td>
<td>3.18</td>
</tr>
<tr>
<td>Years Taking Piano Lessons</td>
<td>5</td>
<td>20</td>
<td>13.08</td>
<td>4.33</td>
</tr>
<tr>
<td>Days of Weekly Practice</td>
<td>4</td>
<td>7</td>
<td>5.54</td>
<td>1.11</td>
</tr>
<tr>
<td>Minutes of Daily Practice</td>
<td>75</td>
<td>360</td>
<td>183.7</td>
<td>90</td>
</tr>
<tr>
<td>Predictive Evaluation Score*</td>
<td>22</td>
<td>30</td>
<td>26.54</td>
<td>2.25</td>
</tr>
<tr>
<td>Predictive Percentile Ranking</td>
<td>20</td>
<td>100</td>
<td>61.36</td>
<td>24.09</td>
</tr>
</tbody>
</table>

*The maximum points possible for the evaluation form = 32.

Among the total sample ($N = 12$), participants reported having played the piano for an average of 14 years and having taken formal piano lessons for an average of 13 years (See Table 3.1). The longest duration of years a participant had played the piano was 20 years while the shortest duration was 10 years. The fewest number of years a participant had taken formal piano lessons was 5 years. The average number of days practiced each week was 5.54 with a standard deviation of 1.11. The fewest reported number of average days of weekly practice was 4. Participants recorded having practiced on average 183 minutes per day with 75 as the fewest and 360 as the most. No participant predicted an evaluation score higher than 30 points out of a possible 32 and no participant predicted an evaluation score lower than 22. The average percentile ranking reported by participants was 61.34% with a standard deviation of 24.09%.
Among the responses gathered from the total sample (N = 12), descriptive statistics were also calculated for the General Information portion of the pretest questionnaire data among groups of undergraduate (N = 6) and graduate (N = 6) participants. As reported in Table 3.2, both undergraduate and graduate groups of participants averaged 14.16 years having played the piano. The standard deviation in this category differed somewhat at 3.12 for undergraduate and 3.54 for graduate participants. The average number of years having taken formal piano lessons was also similar between the two groups—13 years for undergraduate and 13.16 years for graduate participants.

Graduate participants reported an average of 205 minutes of daily practice whereas undergraduate participants indicated an average of 162.5 minutes. Undergraduate participants reported higher estimations than graduate participants in categories of predictive evaluation scores and percentile ranking. Average evaluation scores for undergraduate participants were lower than average actual evaluation scores for graduate participants (See Table 3.2).

Table 3.2

Descriptive Statistics for Pretest Questionnaire by Classification

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Min.</th>
<th>Max.</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years Playing the Piano</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate</td>
<td>6</td>
<td>11</td>
<td>20</td>
<td>14.16</td>
<td>3.12</td>
</tr>
<tr>
<td>Graduate</td>
<td>6</td>
<td>10</td>
<td>19</td>
<td>14.16</td>
<td>3.54</td>
</tr>
<tr>
<td>Years Taking Piano Lessons</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate</td>
<td>6</td>
<td>5</td>
<td>20</td>
<td>13</td>
<td>4.89</td>
</tr>
<tr>
<td>Graduate</td>
<td>6</td>
<td>8</td>
<td>19</td>
<td>13.16</td>
<td>4.16</td>
</tr>
<tr>
<td>Days of Weekly Practice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate</td>
<td>6</td>
<td>4</td>
<td>7</td>
<td>5.25</td>
<td>1.08</td>
</tr>
<tr>
<td>Graduate</td>
<td>6</td>
<td>4</td>
<td>7</td>
<td>5.83</td>
<td>1.16</td>
</tr>
<tr>
<td>Minutes of Daily Practice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate</td>
<td>6</td>
<td>75</td>
<td>330</td>
<td>162.5</td>
<td>93.15</td>
</tr>
</tbody>
</table>
Note. *The maximum points possible for the evaluation form = 32. Among graduate participants, there were only 5 respondents for items titled, “predictive evaluation score” and “predictive percentile ranking.”

Descriptive Statistics for Part Two of the Pretest Questionnaire: Metacognition

Part two of the pretest questionnaire assessed participants’ metacognitive skills—that is, participants’ knowledge of self-regulation and self-evaluation. The researcher designed 20 statements using a 5-point Likert scale along a continuum ranging from Strongly Disagree to Strongly Agree. To reduce extreme response bias and acquiescent bias, statements were a mix of 11 negative and 9 positive. The maximum points possible for the pretest questionnaire metacognition portion was 100. Statements varied from subjects about memorization to performance pressures, learning strategies to evaluation, and piano lessons to problem solving.

Table 3.3

<table>
<thead>
<tr>
<th>Descriptive Statistics for Pretest Questionnaire Composite Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>12</td>
</tr>
</tbody>
</table>

Note. Maximum points possible for pretest questionnaire composite score = 100.

Responses to statements #1-4 are reported in Figure 3.1. Among the total sample (N = 12), 67% of participants responded positively to statement #1, “I know when I have
correctly learned to play a piece of music.” 24% of participants responded in agreement (8% Agree and 17% Strongly Agree) to statement #2, which referenced difficulty in attaining dependable memorization of music. In statement #4, 75% of participants indicated not knowing what their teacher expected of them to learn in lessons.

![Stacked Bar Charts for Statements #1-4](image)

Figure 3.1. Stacked Bar Charts for Statements #1-4.

As reported in Figure 3.2, 32% of participants disagreed (25% Disagreement and 8% Strong Disagreement) with statement #5, which said, “When I have finished practicing, I ask myself if I have improved.” Only 16% of participants disagreed with statement #6, which said, “When practicing, I do not utilize several methods to correct errors.” More than 80% of participants reported agreement with statement #7 regarding thinking about what they needed to improve when practicing. Statement #8, which reads, “I play through repertoire until it is completely learned,” received nearly equal parts 25%
aggregated disagreement, 42% neither agree nor disagree, and 33% aggregated agreement.

[Responses to Statements #5-8]

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. When I have finished practicing, I ask myself if I have improved.</td>
<td>8%</td>
<td>25%</td>
<td>42%</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>6. When practicing, I do not utilize several methods to correct errors.</td>
<td>8% 8%</td>
<td></td>
<td>33%</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>7. When practicing, I think about what I need to improve.</td>
<td>8%</td>
<td>42%</td>
<td>42%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. I play through repertoire until it is completely learned.</td>
<td>8% 17%</td>
<td></td>
<td>33%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 3.2. Stacked Bar Charts for Statements #5-8.

As noted in Figure 3.3, 84% of participants reported aggregated agreement with statement #9, “Depending on the problem, I use differing learning methods when practicing.” Only 8% disagreed with statement #9. In statement #10, 66% of participants agreed that they perform to the best of their ability when in piano lessons. 0% of participants agreed with statement #11, “I sometimes do not decide what I need to accomplish before starting practice” and 33% of respondents neither agreed nor disagreed with the statement. In statement #12, 66% of participants disagreed (33% Disagreement
and 33% Strong Disagreement) with statement #12, which said, “When practicing, my mind sometimes wanders.”

![Figure 3.3. Stacked Bar Charts for Statements #9-12.](image)

As reflected in Figure 3.4, 50% of participants responded in disagreement (33% disagreed and 17% strongly disagreed) to the statement, “When memorizing, I play through my music until it is memorized.” 33% were indifferent to this statement, responding with “neither agree nor disagree.” Only 8% of participants responded “strongly disagree” to the statement, “I am sometimes unaware when I have correctly learned to play something”; 0% of participants responded with “strongly agree.” To the statement, “I am not able to perform well under pressure,” 41% of participants were in agreement and 42% were in disagreement.
Responses to the last 4 statements of the pretest questionnaire are reported in Figure 3.5. 42% of participants responded in agreement to the statement, “When being evaluated, I do not perform my best” with 50% responding in disagreement. Only 25% of participants disagreed with the statement, “I sometimes utilize learning strategies without thinking about them.” 58% of participants agreed with the statement, “I cannot always attain dependable memorization of my music” while only 8% strongly disagreed.
Part three of the pretest questionnaire asked participants to describe 3 learning methods used when practicing. Data were collected using short-answer responses. Of the 12 participants, 4 did not complete the practice methods portion of the pretest questionnaire. Some responses included more than one practice method, such as the response, “Memorize immediately and analyze [the] piece,” which refers to both memorization and analysis.

Frequencies of short-answer responses are reported in Table 3.4. Practice methods characterized as “sectional” were reported with the highest frequency (6 times). Participants described sectional practice as “work on individual measure sections instead of the whole thing,” “practicing in small sections,” “don’t play through the piece every time, always find something specific to practice,” “breaking down music into smaller
bits,” “practicing sections,” and “sectional work—practicing small sections slowly until desired fluency then working way backwards repeating process and chaining together small sections for cohesiveness.”

Table 3.4

*Frequency of Responses for Part Three of the Pretest Questionnaire*

<table>
<thead>
<tr>
<th>Practice Method</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sectional practice</td>
<td>6</td>
</tr>
<tr>
<td>Slow practice</td>
<td>5</td>
</tr>
<tr>
<td>Harmonic analysis</td>
<td>4</td>
</tr>
<tr>
<td>Varying rhythmic accent</td>
<td>2</td>
</tr>
<tr>
<td>Listen to music with score away from piano</td>
<td>2</td>
</tr>
<tr>
<td>Play through while taking notes</td>
<td>2</td>
</tr>
<tr>
<td>Hands separate practice</td>
<td>1</td>
</tr>
<tr>
<td>Memorize immediately</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note.* 4 of the 12 participants in this study did not complete the Practice Methods portion of the pretest questionnaire.

Listed second highest in frequency of practice methods was “slow practice,” occurring 5 times. “Harmonic analysis” was reported by 4 participants, including the descriptions, “memorize stuff immediately and analyze piece,” “breaking down/analyzing smaller bits of music. I look for melody, harmonic progression, how it fits in the context of the piece, etc.,” “try to play through and remember the harmony,” and “breaking the passage down harmonically and listening to where they lead and what voices lead them.”

Practice methods described as “varied rhythmic accents,” “listening to music with score away from piano,” and “playing through while taking notes” were each reported 2
times by participants. Reported only 1 time were the practice methods “hands separate practice” and “memorize immediately.”

Descriptive Statistics: Evaluation and Self-Evaluation Forms

Following the completion of the pretest questionnaire, participants performed piano juries for a panel of piano faculty in the Recital Hall of the University of South Carolina’s School of Music. During each participant’s jury performance, a faculty member who was not the teacher of the performing participant evaluated the performance using the evaluation form shown in Table 3.5. Participants used the same form for self-evaluation following their own jury performance. The evaluation forms included 8 areas of critique: (1) Memory control, (2) Note accuracy, (3) Tempo control, (4) Rhythmic accuracy, (5) Articulation accuracy, (6) Dynamic Accuracy, (7) Tone Quality, and (8) Expressivity. Evaluation was made on a 4-point continuum in which 1=Poor, 2=Fair, 3=Good, and 4=Excellent. The maximum score possible for evaluation forms was 32.

Descriptive statistics for the actual- and self-evaluation forms are shown in Table 3.6. The mean scores for actual- and self-evaluations were 25.83 and 24.41, respectively. Minimum and maximum scores among the actual and self-evaluations were also quite similar. The highest self-evaluation score was 30 points out of a possible 32 points, whereas the highest actual-evaluation score was 31 points out of a possible 32. Participants’ minimum self-evaluation score was 20 points and the minimum actual-evaluation score was 18. The greatest disparity in scores is evident in the median and standard deviation. For actual-evaluations, the median score was 28, while the median
self-evaluation score was 23. Similarly, the standard deviation was 3.14 for actual-evaluations and 4.72 for self-evaluations.

<table>
<thead>
<tr>
<th></th>
<th>Poor</th>
<th>Fair</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory Control</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Note Accuracy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Tempo Control</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Rhythmic Accuracy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Articulation Accuracy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Dynamic Accuracy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Tone Quality</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Expressivity</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

*Figure 3.6. Evaluation Form.*

Of the actual-evaluations for the total sample (N = 12), Tone Quality received the lowest mean score for an area of evaluation—2.69 out of a maximum of 4 points possible. Among self-evaluations for the total sample (N = 12), the lowest mean score for an area of evaluation was Note Accuracy with 2.54 out of a maximum of 4 points possible. The highest mean score among actual-evaluations for the total sample (N = 12) was Rhythmic Accuracy, which scored 3.38 out of a maximum of 4 points possible. And among self-evaluations for the total sample (N = 12), Dynamic Accuracy recorded the highest mean score of an area of evaluation, receiving 3 out of a maximum 4 points possible.
Table 3.5

Descriptive Statistics for Actual- and Self-Evaluation Scores

<table>
<thead>
<tr>
<th></th>
<th>Min.</th>
<th>Max.</th>
<th>Mdn</th>
<th>$\bar{M}$</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Evaluation</td>
<td>18</td>
<td>31</td>
<td>28</td>
<td>25.83</td>
<td>4.72</td>
</tr>
<tr>
<td>Self-Evaluation</td>
<td>20</td>
<td>30</td>
<td>23</td>
<td>24.41</td>
<td>3.14</td>
</tr>
</tbody>
</table>

*Note.* Maximum score possible for evaluations = 32.

**Correlative Statistics**

To determine the existence of correlation among data, the researcher used the Pearson product-moment correlation coefficient. Pearson’s correlation coefficient ($r$) measures the linear relationship between two variables using a scale of -1 to 0 to +1 in which -1 indicates a negative linear relationship, 0 denotes no linear relationship, and +1 signifies a positive linear relationship. A positive linear relationship indicates that two variables “go together” or vary together. Meaning that within a positive linear relationship (0 to +1), knowledge of variable X can help predict variable Y. To state it differently, within a positive correlation between two variables, high values for variable X are associated with high values for Y; and low values for variable X are associated with low values for Y. Within a negative linear relationship (-1 to 0), high values for one variable are associated with low values for the other.

Evans (1996) suggests that a correlation coefficient ($r$) of .0-.19 is very weak, .20-.39 is weak, .40-.59 is moderate, .60-.79 is strong, and .80-1.0 is very strong, whereas Cohen (1988) proposes that a correlation coefficient ($r$) of .10-.30 is weak, .30-.50 is moderate, and .50-1.0 is strong. Statistical significance was determined using a two-tailed test in which $\rho$ equaled less than the critical alpha value ($\alpha$) of .05. Correlations with
statistical significance indicate there was less than a .05 chance that the observed relationship was due to random sampling variability.

To assess the relationships among the pretest questionnaire composite score, the predictive, actual, and self-evaluation scores, the researcher computed a Pearson product-moment correlation coefficient for pairs of variables. Results are shown in Figures 3.8 and 3.9. A very weak negative correlation ($r = -0.104$, $n = 11$, $p = 0.762$) was identified between the pretest questionnaire composite and the predictive evaluation scores, meaning that these two variables do not vary together. A strong positive correlation ($r = 0.710$, $n = 12$, $p = 0.010$) was identified between the pretest questionnaire composite and actual evaluation scores. This can be interpreted as indicating that increases in pretest questionnaire composite scores correlate with increases in actual evaluation scores. Results showed a weak positive correlation ($r = 0.417$, $n = 12$, $p = 0.178$) between the pretest questionnaire composite and self-evaluation scores. For the actual and self-evaluation scores, results indicated a positive correlation ($r = 0.623$, $n = 12$, $p = 0.031$). For this pair of variables, increases in actual evaluation scores correlated with increases in self-evaluation scores.
Next, the researcher investigated the existence of bivariate relationships between data using the Pearson product-moment correlation coefficient. 4 Pairs of data were examined: (1) individual statements from the pretest questionnaire and the pretest questionnaire composite score, (2) individual statements from the pretest questionnaire and actual evaluation scores, (3) individual statements from the pretest questionnaire and self-evaluation scores, and (4) individual statements from the pretest questionnaire and predictive evaluation scores.

In review, part two of the pretest questionnaire investigated the presence of metacognitive skills among participants. Data was collected using a 5-point Likert scale with responses ranging from “strongly disagree” to “strongly agree.” Statements focused on the primary elements of metacognition—self-regulation and self-evaluation. The total composite score possible for part two of the pretest questionnaire was 100. This score
represents, to a lesser or greater degree, participants’ self-awareness, their metacognition, in regards to how they practice and perform.

Table 3.6

Results from the Pearson Product-Moment Correlation Coefficient Test between Individual Statements from Part Two of the Pretest Questionnaire and Pretest Questionnaire Composite Scores

<table>
<thead>
<tr>
<th></th>
<th>Statement</th>
<th>n</th>
<th>r</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I know when I have correctly learned to play a piece of music.</td>
<td>12</td>
<td>.645</td>
<td>.024*</td>
</tr>
<tr>
<td>2</td>
<td>I struggle to attain dependable memorization of my music.</td>
<td>12</td>
<td>.630</td>
<td>.028*</td>
</tr>
<tr>
<td>3</td>
<td>When practicing alone, I do not perform well.</td>
<td>12</td>
<td>.761</td>
<td>.098</td>
</tr>
<tr>
<td>4</td>
<td>In lessons, I sometimes do not know what my teacher expects me to learn.</td>
<td>12</td>
<td>.533</td>
<td>.074</td>
</tr>
<tr>
<td>5</td>
<td>When I have finished practicing, I ask myself if I have improve</td>
<td>12</td>
<td>-.054</td>
<td>.868</td>
</tr>
<tr>
<td>6</td>
<td>When practicing, I do not utilize several methods to correct errors.</td>
<td>12</td>
<td>.460</td>
<td>.132</td>
</tr>
<tr>
<td>7</td>
<td>When practicing, I think about what I need to improve.</td>
<td>12</td>
<td>.542</td>
<td>.069</td>
</tr>
<tr>
<td>8</td>
<td>I play through repertoire until it is completely learned.</td>
<td>12</td>
<td>-.246</td>
<td>.441</td>
</tr>
<tr>
<td>9</td>
<td>Depending on the problem, I use differing learning methods when practicing.</td>
<td>12</td>
<td>.572</td>
<td>.052</td>
</tr>
<tr>
<td>10</td>
<td>When in a piano lesson, I perform to my best ability.</td>
<td>12</td>
<td>.015</td>
<td>.964</td>
</tr>
<tr>
<td>11</td>
<td>I sometimes do not decide what I need to accomplish before starting practice.</td>
<td>12</td>
<td>.326</td>
<td>.301</td>
</tr>
<tr>
<td>12</td>
<td>When practicing, my mind sometimes wanders.</td>
<td>12</td>
<td>.380</td>
<td>.223</td>
</tr>
<tr>
<td>13</td>
<td>When memorizing, I play through my music until it is memorize.</td>
<td>12</td>
<td>.266</td>
<td>.403</td>
</tr>
<tr>
<td>14</td>
<td>When practicing, I ask myself if I am improving.</td>
<td>12</td>
<td>.734</td>
<td>.007*</td>
</tr>
<tr>
<td>15</td>
<td>I am sometimes unaware when I have correctly learned to play something.</td>
<td>12</td>
<td>.507</td>
<td>.092</td>
</tr>
<tr>
<td>16</td>
<td>I am not able to perform well under pressure.</td>
<td>12</td>
<td>.653</td>
<td>.021*</td>
</tr>
<tr>
<td>17</td>
<td>When being evaluated, I do not perform my best.</td>
<td>12</td>
<td>.775</td>
<td>.003*</td>
</tr>
</tbody>
</table>
18) When practicing, I try using practice methods that have worked for me in the past.  
   12 .496 .101

19) I sometimes utilize learning strategies without thinking about them.  
   12 .401 .196

20) I cannot always attain dependable memorization of my music.  
   12 .669 .007*

Note. A p-value less than .05 indicates significance.

Among the pretest questionnaire composite score and individual statements from part two of the pretest questionnaire, positive linear relationships were identified with statements #1, #2, #14, #16, #17, and #20, which may be interpreted as meaning that high composite scores on part two of the pretest questionnaire were related to high scores for the responses to statements #1, #2, #14, #16, #17, and #20. Complete results are shown in Table 3.8.

Results indicated no significant positive or negative correlation between individual statements from part two of the pretest questionnaire and predictive or self-evaluative scores (Shown in Tables 3.9 and 3.10. Between individual statements from part two of the pretest questionnaire and actual evaluation scores, however, significant positive correlation was found with questions #14, #19, #20. Table 3.11 shows that statement #14 from part two of the pretest questionnaire holds a moderate correlation with scores from the actual evaluation (r = .594, p = .024). Statements #19 and #20 held strong and very strong, respectively, correlations with actual evaluation scores.

Table 3.7

Results from the Pearson Product-Moment Correlation Coefficient Test for Individual Statements from Part Two of the Pretest Questionnaire and Evaluation Scores

<table>
<thead>
<tr>
<th>n</th>
<th>r</th>
<th>p-value</th>
</tr>
</thead>
</table>

68
1) I know when I have correctly learned to play a piece of music.  12  .324  .304
2) I struggle to attain dependable memorization of my music.  12  .532  .057
3) When practicing alone, I do not perform well.  12  .254  .425
4) In lessons, I sometimes do not know what my teacher expects me to learn.  12  .308  .330
5) When I have finished practicing, I ask myself if I have improve  12  -.177  .582
6) When practicing, I do not utilize several methods to correct errors.  12  .456  .136
7) When practicing, I think about what I need to improve.  12  .232  .468
8) I play through repertoire until it is completely learned.  12  .000  1.0
9) Depending on the problem, I use differing learning methods when practicing.  12  .351  .263
10) When in a piano lesson, I perform to my best ability.  12  .012  .972
11) I sometimes do not decide what I need to accomplish before starting practice.  12  .419  .175
12) When practicing, my mind sometimes wanders.  12  .362  .247
13) When memorizing, I play through my music until it is memorize.  12  -.035  .915
14) When practicing, I ask myself if I am improving.  12  .590  .043*
15) I am sometimes unaware when I have correctly learned to play something.  12  .280  .378
16) I am not able to perform well under pressure.  12  .111  .732
17) When being evaluated, I do not perform my best.  12  .353  .260
18) When practicing, I try using practice methods that have worked for me in the past.  12  .221  .489
19) I sometimes utilize learning strategies without thinking about them.  12  .663  .019*
20) I cannot always attain dependable memorization of my music.  12  .836  .001*

*Note. A p-value less than .05 indicates significance.
Table 3.8

Results from the Pearson Product-Moment Correlation Coefficient Test for Individual Statements from Part Two of the Pretest Questionnaire and Self-Evaluation Scores

<table>
<thead>
<tr>
<th></th>
<th>Statement</th>
<th>n</th>
<th>r</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I know when I have correctly learned to play a piece of music.</td>
<td>12</td>
<td>.170</td>
<td>.597</td>
</tr>
<tr>
<td>2</td>
<td>I struggle to attain dependable memorization of my music.</td>
<td>12</td>
<td>.361</td>
<td>.250</td>
</tr>
<tr>
<td>3</td>
<td>When practicing alone, I do not perform well.</td>
<td>12</td>
<td>.327</td>
<td>.299</td>
</tr>
<tr>
<td>4</td>
<td>In lessons, I sometimes do not know what my teacher expects me to learn.</td>
<td>12</td>
<td>.383</td>
<td>.219</td>
</tr>
<tr>
<td>5</td>
<td>When I have finished practicing, I ask myself if I have improve</td>
<td>12</td>
<td>- .119</td>
<td>.713</td>
</tr>
<tr>
<td>6</td>
<td>When practicing, I do not utilize several methods to correct errors.</td>
<td>12</td>
<td>.275</td>
<td>.387</td>
</tr>
<tr>
<td>7</td>
<td>When practicing, I think about what I need to improve.</td>
<td>12</td>
<td>- .30</td>
<td>.926</td>
</tr>
<tr>
<td>8</td>
<td>I play through repertoire until it is completely learned.</td>
<td>12</td>
<td>.416</td>
<td>.178</td>
</tr>
<tr>
<td>9</td>
<td>Depending on the problem, I use differing learning methods when practicing.</td>
<td>12</td>
<td>.121</td>
<td>.708</td>
</tr>
<tr>
<td>10</td>
<td>When in a piano lesson, I perform to my best ability.</td>
<td>12</td>
<td>.185</td>
<td>.565</td>
</tr>
<tr>
<td>11</td>
<td>I sometimes do not decide what I need to accomplish before starting practice.</td>
<td>12</td>
<td>.411</td>
<td>.184</td>
</tr>
<tr>
<td>12</td>
<td>When practicing, my mind sometimes wanders.</td>
<td>12</td>
<td>.229</td>
<td>.474</td>
</tr>
<tr>
<td>13</td>
<td>When memorizing, I play through my music until it is memorize.</td>
<td>12</td>
<td>- .085</td>
<td>.792</td>
</tr>
<tr>
<td>14</td>
<td>When practicing, I ask myself if I am improving.</td>
<td>12</td>
<td>.128</td>
<td>.691</td>
</tr>
<tr>
<td>15</td>
<td>I am sometimes unaware when I have correctly learned to play something.</td>
<td>12</td>
<td>.073</td>
<td>0821</td>
</tr>
<tr>
<td>16</td>
<td>I am not able to perform well under pressure.</td>
<td>12</td>
<td>- .061</td>
<td>.852</td>
</tr>
<tr>
<td>17</td>
<td>When being evaluated, I do not perform my best.</td>
<td>12</td>
<td>.218</td>
<td>.497</td>
</tr>
<tr>
<td>18</td>
<td>When practicing, I try using practice methods that have worked for me in the past.</td>
<td>12</td>
<td>- .304</td>
<td>.336</td>
</tr>
<tr>
<td>19</td>
<td>I sometimes utilize learning strategies without thinking about them.</td>
<td>12</td>
<td>.187</td>
<td>.561</td>
</tr>
</tbody>
</table>
20) I cannot always attain dependable memorization of my music.  

Note. A p-value less than .05 indicates significance.

Table 3.9

Results from the Pearson Product-Moment Correlation Coefficient Test for Individual Statements from Part Two of the Pretest Questionnaire and Predictive Evaluation Scores

<table>
<thead>
<tr>
<th>Statement</th>
<th>n</th>
<th>r</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) I know when I have correctly learned to play a piece of music.</td>
<td>12</td>
<td>-.203</td>
<td>.550</td>
</tr>
<tr>
<td>2) I struggle to attain dependable memorization of my music.</td>
<td>12</td>
<td>-.047</td>
<td>.891</td>
</tr>
<tr>
<td>3) When practicing alone, I do not perform well.</td>
<td>12</td>
<td>.163</td>
<td>.633</td>
</tr>
<tr>
<td>4) In lessons, I sometimes do not know what my teacher expects me to learn.</td>
<td>12</td>
<td>.316</td>
<td>.344</td>
</tr>
<tr>
<td>5) When I have finished practicing, I ask myself if I have improve</td>
<td>12</td>
<td>.053</td>
<td>.877</td>
</tr>
<tr>
<td>6) When practicing, I do not utilize several methods to correct errors.</td>
<td>12</td>
<td>.041</td>
<td>.905</td>
</tr>
<tr>
<td>7) When practicing, I think about what I need to improve.</td>
<td>12</td>
<td>.068</td>
<td>.842</td>
</tr>
<tr>
<td>8) I play through repertoire until it is completely learned.</td>
<td>12</td>
<td>.586</td>
<td>.058</td>
</tr>
<tr>
<td>9) Depending on the problem, I use differing learning methods when practicing.</td>
<td>12</td>
<td>-.140</td>
<td>.682</td>
</tr>
<tr>
<td>10) When in a piano lesson, I perform to my best ability.</td>
<td>12</td>
<td>.086</td>
<td>.800</td>
</tr>
<tr>
<td>11) I sometimes do not decide what I need to accomplish before starting practice.</td>
<td>12</td>
<td>.131</td>
<td>.701</td>
</tr>
<tr>
<td>12) When practicing, my mind sometimes wanders.</td>
<td>12</td>
<td>-.346</td>
<td>.298</td>
</tr>
<tr>
<td>13) When memorizing, I play through my music until it is memorize.</td>
<td>12</td>
<td>-.457</td>
<td>.246</td>
</tr>
<tr>
<td>14) When practicing, I ask myself if I am improving.</td>
<td>12</td>
<td>-.251</td>
<td>.457</td>
</tr>
<tr>
<td>15) I am sometimes unaware when I have correctly learned to play something.</td>
<td>12</td>
<td>.201</td>
<td>.554</td>
</tr>
<tr>
<td>16) I am not able to perform well under pressure.</td>
<td>12</td>
<td>-.261</td>
<td>.438</td>
</tr>
<tr>
<td>17) When being evaluated, I do not perform my best.</td>
<td>12</td>
<td>-.009</td>
<td>.978</td>
</tr>
<tr>
<td>18) When practicing, I try using practice methods that have</td>
<td>12</td>
<td>-.488</td>
<td>.128</td>
</tr>
</tbody>
</table>
worked for me in the past.

19) I sometimes utilize learning strategies without thinking about them.  
20) I cannot always attain dependable memorization of my music.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>r</td>
<td>p-value</td>
</tr>
<tr>
<td>12</td>
<td>-.151</td>
<td>.658</td>
</tr>
<tr>
<td>12</td>
<td>-.074</td>
<td>.828</td>
</tr>
</tbody>
</table>

Note. A p-value less than .05 indicates significance.

The researcher also used the Pearson product-moment correlation coefficient to investigate the presence of any relationship between individual statements from part two of the pretest questionnaire. Complete results from the Pearson product-moment correlation coefficient test among individual statements form part two of the pretest questionnaire included 400 sets of data; consequently, the researcher chose to include only statistically significant correlations in this document. Results are shown in Tables 3.12–3.14. Of particular significance, statement #1 correlated strongly with 4 statements—numbers 7, 9, 16, and 17. Statement #1 reads, “I know when I have correctly learned to play a piece of music.” Correlating statements #7 and #9 were also written in the positive, but statements #16 and #17 were not.

Table 3.10

Results from the Pearson Product-Moment Correlation Coefficient Test for Statement #2 with Statements #7, #9, #16, and #17 from Part Two of the Pretest Questionnaire

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7) When practicing, I think about what I need to improve.</td>
<td>12</td>
<td>.701 .011*</td>
</tr>
<tr>
<td>9) Depending on the problem, I use differing learning methods when practicing.</td>
<td>12</td>
<td>.701 .011*</td>
</tr>
<tr>
<td>16) I am not able to perform well under pressure.</td>
<td>12</td>
<td>.668 .018*</td>
</tr>
<tr>
<td>17) When being evaluated, I do not perform my best.</td>
<td>12</td>
<td>.730 .007*</td>
</tr>
</tbody>
</table>

Note. A p-value less than .05 indicates significance.
Also of notable mention, statement #2 correlated moderately with statement #20 and strongly with statements #4, #6, and #12. Statement #2 was written in the negative: “I struggle to attain dependable memorization of my music.” All four of the correlating statements—#4, #6, #12, and #20—were also written in the negative and addressed areas of self-regulation. Results are listed in Table 3.11.

Table 3.11

<table>
<thead>
<tr>
<th>Statement</th>
<th>Correlation with Statement #2</th>
<th>n</th>
<th>r</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4) In lessons, I sometimes do not know what my teacher expects me to learn.</td>
<td>12</td>
<td>.620</td>
<td>.031*</td>
<td></td>
</tr>
<tr>
<td>6) When practicing, I do not utilize several methods to correct errors.</td>
<td>12</td>
<td>.607</td>
<td>.036*</td>
<td></td>
</tr>
<tr>
<td>12) When practicing, my mind sometimes wanders.</td>
<td>12</td>
<td>.691</td>
<td>.013*</td>
<td></td>
</tr>
<tr>
<td>20) I cannot always attain dependable memorization of my music.</td>
<td>12</td>
<td>.587</td>
<td>.045*</td>
<td></td>
</tr>
</tbody>
</table>

Note. A p-value less than .05 indicates significance.

Lastly, statement #7 correlated moderately with statement #14 and strongly with statements #17 and #18, as shown in Table 3.12. Statement #7 reads, “When practicing, I think about what I need to improve.” Statements #14 and #18 dealt with areas of self-regulation, reading, “When practicing, I ask myself if I am improving” and “When practicing, I try using practice methods that have worked for me in the past,” respectively. Statement #17 was written in the negative and referred to self-evaluation, stating, “When being evaluated, I do not perform my best.”
Table 3.12

*Results from the Pearson Product-Moment Correlation Coefficient Test for Statement #2 with Statements #14, #17, and #18 from Part Two of the Pretest Questionnaire*

<table>
<thead>
<tr>
<th>Statement</th>
<th>n</th>
<th>r</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>14) When practicing, I ask myself if I am improving.</td>
<td>12</td>
<td>.598</td>
<td>.040*</td>
</tr>
<tr>
<td>17) When being evaluated, I do not perform my best.</td>
<td>12</td>
<td>.645</td>
<td>.023*</td>
</tr>
<tr>
<td>18) When practicing, I try using practice methods that have worked for me in the past.</td>
<td>12</td>
<td>.736</td>
<td>.006*</td>
</tr>
</tbody>
</table>

*Note.* A p-value less than .05 indicates significance.

Among the 20 statements from part two of the pretest questionnaire, only two pairs of statements correlated negatively beyond the -.5 threshold: #6 and #10 (r = -.549, p = .065) and #7 and #12 (r = -.565, p = .056). Statements #6 and #10 read, “When practicing, I do not utilize several methods to correct error,” and “When in a piano lesson, I perform to my best ability,” respectively; and statements #7 and #12 read, “when practicing, I think about what I need to improve,” and “When practicing, my mind sometimes wanders,” respectively. The p-values for these correlations did not reach the .05 level of significance. Negative correlations, though not reaching levels of significance, indicate that where one variable increased, the other decreased.
CHAPTER 4

DISCUSSION AND CONCLUSION

Metacognitive skills are essential to successful musical development (Scott, 2006; Hallam, 1997; Scraw et al., 2006; Miklaszewski, 1989; Nielsen, 1997; McPherson, 2001; Byo and Cassidy, 2008; Miksza, 2012; Kerka, 2006; Davidson and Scripp, 1990). Arthur Costa defined metacognition as “our ability to know what we know and what we don’t know” (Costa, 1984). It represents one’s ability to form strategies when approaching a learning task, to consciously attend to strategic steps when problem solving, and to reflect on and evaluate the results of one’s own thinking (Costa, 1984). Research indicates that metacognition is present in children as young as age 4 (Schraw and Moschman, 1995) and that it can develop implicitly, without awareness, as well as explicitly throughout childhood, adolescence, and adulthood (Kuhn and Dean, 2004). Researchers believe metacognition is teachable (Cross and Paris, 1988; Hennessey, 1999; Kuhn and Dean, 2004; Boardman, 2002) and that it holds unique application to specific domains of study such as music (Colwell, 2011; Chiu and Kuo, 2009; Benton, 2014).

Much of metacognitive research among musicians has included pre-college general music classes (Johnson, 2011; Robinson, Bell, Pogonowski, 2011; Mathias, 1997) and middle school and high school instrumental ensembles (Hewitt, 2002; Bauer, 2008; McPherson and Renwick, 2001; David and Scripp, 1990; Aitchison, 1995; Morrison, Montemayor, and Wiltshire, 2011). Research shows that metacognitive
engagement supports more effective conception, implementation, and monitoring of musical learning strategies, as well as more accurate self-evaluation following a performance (Scott, 2006; Hallam, 1997; Scraw et al., 2006; Miklaszewski, 1989; Nielsen, 1997; McPherson, 2001; Byo and Cassidy, 2008; Miksza, 2012; Kerka, 2006; Davidson and Scripp, 1990). Because metacognition is recognized as vital to effective music practicing, learning, and performing (Hallam, 2001; Boradman, 2002; Hanna, 2007; McPhail, 2010; Benton, 2014), some music researchers have asserted the importance of including metacognitive instruction in the classroom and in private lessons (Lisk, 2006; Boardman, 2002; Pognowski, 1989; Hanna, 2007).

The purpose of this study was to measure self-reported metacognitive habits among collegiate piano majors. It examined the degree to which participants comprehend and employ practice strategies, recognize their own strengths and weaknesses in learning and performing, accurately predict a performance outcome, and self-evaluate following a performance. This final chapter includes a discussion of the results of this study, recommended modifications and opportunities for future research related to this study, and present implications for metacognition in piano pedagogy.

Discussion of the Results from the Study

In review, the following research questions guided this study:

1. What metacognitive habits do collegiate piano majors possess?

2. How do collegiate piano majors measure their own abilities against that of their peers?
3. How accurately do collegiate piano majors predict their own performance outcome? And how does this predictive accuracy correlate with self-reported metacognitive skills?

4. How accurately self-evaluate following a performance? And how does this self-evaluation correlate with their actual performance evaluation?

5. In what ways do specific metacognitive habits correlate with performance ability?

To answer research question #1, “What metacognitive habits do collegiate piano majors possess?” the researcher administered a pretest questionnaire and self-evaluation form aimed at identifying participants’ own self-regulative and self-evaluative skills. The pretest questionnaire gathered data in three parts: (1) general information, (2) metacognition, and (3) practice methods. Part one collected information about participants’ classification and degree program, number of years having played the piano, number of years having taken formal piano lessons, average number of weekly practice days, average number of daily practice minutes, predictive evaluation scores, and predictive percentile ranking. Using a 5-point Likert scale, part two of the pretest questionnaire presented 20 statements concerning participants’ own self-regulative and evaluative skills. Part three of the pretest questionnaire invited participants to describe three learning methods used when practicing.

Part two of the pretest questionnaire contained 20 Likert statements with responses ranging on a 5-point continuum from “strongly disagree” to “strongly agree.” These statements were intended to probe into the metacognitive habits of participants—particularly self-regulative and evaluative habits. The researcher calculated aggregated
results for each statement as well as composite scores for each participant. Composite scores, which were calculated out of a maximum 100 points possible, were intended to indicate a measure of metacognitive strength. Composite scores from this study ranged from 52 to 79, with a mean of 65.41. Of particular note were participants’ responses to 8 statements. In statement #1, 33% of participants reported “disagree” or “neither disagree nor agree” with “I know when I have correctly learned to play a piece of music.” Participants’ disagreement or neutrality with this statement may relate to underdeveloped metacognitive habits in areas of self-regulation and self-evaluation. Among collegiate piano majors, one might have presumed near unanimous agreement with this statement. 75% of participants reported agreement with statement #4, which read, “In lessons, I sometimes do not know what my teacher expects me to learn.”

In statement #6, 84% of participants agreed with the statement, “When practicing, I do not utilize several methods to correct errors.” It is unclear whether the majority of participants confirmed this statement because they (1) implicitly utilize several methods to correct errors in practice, (2) utilize only a few, highly effective methods to correct errors, or (3) truly do not utilize several methods to correct errors. Participants responded 25% of the time in disagreement or “neither agree nor disagree” to the statement, “When practicing, I ask myself if I am improving.” Participants’ disagreement or non-affirmation to this statement may suggest that judgments of improvement occur without conscious recognition; another possibility may be that these participants do not measure their own progress in practice. To the statement #15, “I am sometimes unaware when I have correctly learned to play something,” participants responded 25% of the time in agreement and 33% of the time with neither agree nor disagree. This statement is similar
to statement #1, which also addressed self-regulation—recognizing when learning has occurred. Statement #16 aimed at understanding participants’ self-view of performance anxiety, stating, “I am not able to perform well under pressure.” To this statement, participants agreed 41% of the time and disagreed 42% of the time. 17% were indifferent, reporting neither agreement nor disagreement. Related to statement #16, statement #17 read, “When being evaluated, I do not perform my best,” with which participants agreed 42% of the time. Only 25% of participants strongly disagreed with this statement. Lastly, with statement #20, which read, “I cannot always attain dependable memorization of my music,” 58% of participants agreed and 8% indicated neither agreement nor disagreement. Indicating that only 33% of participants believe they can consistently attain dependable memorization of repertoire.

4 of the 12 participants in this study abstained from completing part three of the pretest questionnaire, which asked participants to describe in short-answer form three learning methods used when practicing. Among the responses from 8 participants who completed the practice methods portion of the pretest questionnaire, descriptions relating to “sectional practice” were mentioned with the greatest frequency at 6 times, followed by “slow practice” with 5 mentions, and “harmonic analysis” reported by 4 participants. Other learning methods reported by participants include using varied rhythmic accents, listening to the music with score away from the piano, playing through repertoire while taking notes, and hands separate practice.

Concerning research question #2, “How do collegiate piano majors measure their own abilities against that of their peers?” Participants were asked to answer the following question on part one of the pretest questionnaire: “Compared to other students performing
jury examinations, in what percentile do you anticipate scoring?” For clarification, this question was followed by a parenthetical explanation that read, “For example, if you believe that you will score higher than 40% of other students, then write ’40.” Among 11 of the 12 participants, the mean percentile ranking was 51.2%; 1 of the participants did not provide a predictive percentile ranking. Undergraduate participants reported a mean percentile ranking of 41% and graduate participants indicated a 63.3% percentile ranking. The maximum for the total sample 90% and the minimum was 10%. Interestingly, the highest percentile ranking (90%) was reported by a graduate student who received an evaluation score of 21 out of 32 total points possible, in actuality, placing him or her in the 33rd percentile. Conversely, the participant who indicated the lowest percentile ranking (10%) scored 28 out of 32 possible points on his or her evaluation, placing him or her in the 50th percentile. 6 of the 11 participants predicted a percentile ranking equivalent or lower than their actual percentile ranking; they underestimated their own abilities against the abilities of their peers.

Regarding research question #3, “How accurately do collegiate piano majors predict their own performance outcome? And how does this predictive accuracy correlate with self-reported metacognitive skills?” among the total sample, participants’ average predicted evaluation score was 26.55 out of a possible 32 points; their average evaluation score was 25.83—an overestimation of 2.7%. Among undergraduate participants, the average predicted evaluation score was 27.3—an overestimation of 7.8%. Among graduate participants, the average predictive evaluation score was 25.6—an underestimation of 2.8%. The minimum and maximum predicted evaluation scores among undergraduate participants were 25 and 30, respectively; for graduate participants
they were 22 and 28. This data shows that undergraduate participants overestimated their performance evaluation, whereas graduate participants underestimated theirs. In view of their predictive accuracy in relation to self-reported metacognitive skills, the Pearson product-moment correlation coefficient revealed no significant positive or negative relationship. Among the groups of undergraduate and graduate participants, the average composite score for part two of the pretest questionnaire, which sought to provide a measure of metacognitive strength, was nearly identical—65.3 out of a possible 100 points for undergraduates and 65.5 for graduates.

Research question #4 stated, “How accurately do collegiate piano majors self-evaluate following a performance? And how does this self-evaluation correlate with their actual performance evaluation?” To answer this question, the researcher designed the study to include an evaluated performance and self-evaluation from each participant. Following the completion of the pretest questionnaire, each participant performed for a jury of piano faculty in the Recital Hall of the University of South Carolina. Participants received evaluation from a faculty juror who was not the their own applied lesson teacher. The evaluation and self-evaluation forms included 8 areas of critique: (1) Memory control, (2) Note accuracy, (3) Tempo control, (4) Rhythmic accuracy, (5) Articulation accuracy, (6) Dynamic Accuracy, (7) Tone Quality, and (8) Expressivity. Evaluation was made on a 4-point scale in which 1=poor, 2=fair, 3=good, and 4=excellent. Among the total sample, the average evaluation score was 25.83 out of a possible 32 points; for self-evaluations the average score was 24.42. Among undergraduate participants, the average evaluation score was 25.33 and for self-evaluations it was 25. In contrast, among graduate participants, the average evaluation score was 26.33, while the average self-
evaluation score was 23.83. The data indicates that among the total sample, participants underestimated their evaluation scores by a margin of 5.8%, however among undergraduate participants, the margin was 1.3% and among graduate participants it was 10.4%. This data suggests that undergraduate participants more accurately self-evaluated than did graduate participants.

The researcher used the Pearson product-moment correlation coefficient to test for any relationship between participants’ evaluation and self-evaluation scores. Among the total sample, tests indicated a positive correlation (r = .634) with a p-value of .031, indicating that high evaluation scores generally varied with high self-evaluation scores. Among undergraduate participants, tests indicated a positive correlation (r = .843) a p-value of .035, meaning that high evaluation scores went together with high self-evaluation scores. Among graduate participants, there was a negative correlation between evaluation and self-evaluation scores (r = -.447, p = .374). This indicates that where graduate participants received high evaluation scores they tended to self-evaluate a lower score.

To answer research question #5, “In what ways do specific metacognitive habits correlate with performance ability?” the researcher used the Pearson product-moment correlation coefficient test to investigate relationships between individual statements from part two of the pretest questionnaire and evaluation scores. Tests revealed significant positive relationships between evaluation scores and three statements from part two of the pretest questionnaire. Statement #14, which reads, “When practicing, I ask myself if I am improving,” held a positive correlation (r = .590, p = .043), suggesting that high evaluation scores vary together with participants’ agreement with statement #14.
Also holding a positive correlation \((r = .663, p = .019)\) with evaluation scores, statement #19 reads, “I sometimes utilize learning strategies without thinking about them.” And lastly, statement #20, “I cannot always attain dependable memorization of my music,” held the strongest positive correlation of the statements from part two of the pretest questionnaire \((r = .836, p = .001)\).

Regarding any relationship between specific practice methods mentioned by participants on part three of the pretest questionnaire and evaluation scores, the researcher found that 4 of the 5 participants who indicated “slow practice” received an evaluation score of 29 or better out of 32 points possible. Regarding any significant correlation between predictive evaluation and evaluation scores, there was only a very weak negative correlation \((r = -.071, p = .836)\). Between self-evaluation and evaluation scores, there was a positive correlation \((r = .623, p = .031)\). And between predictive percentile ranking and evaluation scores, there was a very weak negative correlation \((r = -.118, p = .729)\).

Comparisons between undergraduate and graduate participants’ responses were not defined in the scope of this study; however, interesting patterns emerged and bear mentioning. Descriptive statistics for part one of the pretest questionnaire indicated that the average number of years participants had played the piano was 14.16; incidentally, this average was identical among undergraduate \((N = 6)\) and graduate \((N = 6)\) participants, though the standard deviation differed somewhat among the two groups—3.12 and 3.54, respectively. This may indicate that some graduate students began playing the piano later in life than average undergraduate participants. Similarly, the average number of years participants had reported taking formal piano lessons was again nearly
identical between undergraduate and graduate participants—13 and 13.16, respectively. Remarkably, the minimum number of years participants reported having taken formal piano lessons among undergraduate participants was 5 years and the minimum for graduates was 8 years. This may indicate that at least one undergraduate participant began taking formal piano lessons during his or her teens. Interestingly, the minimum (4) and maximum (7) number of days of weekly practice among undergraduate and graduate participants was equivalent. Where undergraduates and graduates differed was in average minutes of daily practice, for which undergraduates reported 162.5 minutes and graduates indicated 205 minutes. Between undergraduate and graduate participants, the minimum and maximum average minutes of daily practice were reported with more similarity—75 and 330 minutes for undergraduates and 90 and 360 minutes for graduates.

**Recommendations for Future Research**

This study sought to investigate self-reported metacognitive habits among college piano majors. Based on the results of this study, the researcher recommends the following modifications and opportunities for future research:

1. Modification of the pretest questionnaire Likert-scale statements to exclude “not” or “un-“ from wording of negative statements for the purpose of avoiding artificiality and perfunctory responses. In this study, the researcher used a mix of positive and negative wording for statements in the pretest questionnaire. Some believe that alternating statement wording from positive to negative helps to minimize acquiescent bias and extreme response bias (Nunnally, 1978; Anastasi, 1982), while others do not (Lewis and Sauro, 2009).
2. Modification of the pretest questionnaire to more effectively investigate research question #1, “What metacognitive habits do collegiate piano majors possess?” The intention of part two of the pretest questionnaire, which included 20 statements set on a 5-point Likert scale, was to probe participants’ viewpoints regarding self-regulation and self-evaluation. It may be more effective to include an additional section that includes open-ended responses to questions pertaining to metacognitive habits. Moreover, including an interview into the study design may allow participants to express viewpoints related to their own metacognition in a more conversational and in depth manner than responding in written-form to a questionnaire.

3. Modification of statement #3 on the pretest questionnaire. Statement #3 read, “When practicing alone, I do not perform well.” This statement was intended to refer to the quality of one’s playing while practicing alone. However, it appears to have been misinterpreted as meaning “I do not perform well (in concert) when having learned repertoire alone, without expert assistance.” To this interpretation, participants indicated 100% disagreement or “neither agree nor disagree.” Possible modifications may include elimination of this statement from the pretest questionnaire or its rewriting to include more specific language aimed at revealing respondents’ viewpoint of their own ability to play the piano in practice when, presumably, no one is listening or watching.

4. Modification of the evaluation procedure to include an individual as the evaluator who is unrelated to the institution or participants involved in the study. In this study, the procedures only stipulated that the evaluating individual be a member
of the jury who is not also the participant’s applied lesson teacher. This irregularity may have unintentionally led to bias or inconsistencies in completing the evaluations and to study results.

5. Modification of the sample size. Results from a larger sample size may provide greater statistical significance to the study. Future researchers may consider including in the study group piano classes or non-majors enrolled in applied lessons.

Conclusions and Implications for Present Practice

In this study, the researcher investigated metacognitive habits among collegiate piano majors. Results of the Pearson product-moment correlation coefficient revealed a positive correlation ($r = .710$, $p = .010$) between pretest questionnaire composite scores and evaluation scores. This indicates that an increase in pretest questionnaire composite scores varied with an increase in evaluation scores among participants. As the pretest questionnaire measured participants’ metacognitive habits, results from this study may suggest that collegiate piano majors who possess a greater measure of metacognitive skills may also achieve higher performance evaluation scores than collegiate piano majors who possess a lower measure of metacognitive skill.

In particular, piano teachers may consider instructional techniques that address participant responses to 5 statements from the pretest questionnaire:

1) 75% of participants agreed with statement #4, “In lessons, I sometimes do not know what my teacher expects me to learn.” It is important to note the wording of this statement includes, “sometimes”; data collected in response
to this statement does not indicate that 75% students in this study claimed they did not know what their teachers expected of them during lessons. However, in the cases in which this statement is sometimes true, teachers may use literal, not subjectively descriptive, language when expressing learning objectives or expectations in applied lessons. Specificity will mitigate misunderstandings and didacticism will provide effective pathways to problem solving.

2) 25% of participants agreed with statement #15, “I am sometimes unaware when I have correctly learned to play something.” This statement addresses self-evaluation. For a pianist to accurately self-evaluate, he or she must comprehend the musical concepts presented in repertoire, possess the physical technique necessary to play the repertoire, and listen critically to the resultant sounds from playing repertoire. Teachers may first consider providing instruction in musical concepts and requisite technique found in student repertoire (e.g. teaching distinctions among articulations such as non-legato, legato, staccato, and tenuto; and using technical exercises or repertoire to reinforce the concepts). Next, teachers may have students practice critical listening skills during applied lessons (e.g. using play-back exercises during lessons in which the teacher plays an improvised short phrase of music that includes specific articulations, rhythms, notes, and dynamics; or the teacher may play short passages of repertoire and ask the student to identify any intentional mistakes).
3) 41% of participants agreed with statement #16, “I am not able to perform well under pressure” and 42% agreed with statement #17, “When being evaluated, I do not perform my best.” Related to these, 58% of participants agreed with statement #20, which reads, “I cannot always attain dependable memorization of music.” Preparing students to perform well and not simply learn well is a significant challenge for all applied music lesson teachers. Principally, among collegiate applied lesson teachers, the demand to memorize music places an additional layer of burden upon the student preparing to perform as well as the teacher guiding the student. Finding solutions to the performing problems many students face is not impossible; certainly, many collegiate applied lesson teachers are adequately preparing students for successful performing and for others, despite their strategies, students may feel incapable of performing well under pressure. For those teachers seeking solutions, directing students to learn repertoire that realistically fits their reading, technical, and expressive capabilities seems an appropriate place to begin.

The researcher hopes that that the findings of this study will promote further discussion and investigation of metacognition among topics of piano learning, teaching, and performing.
REFERENCES


APPENDIX A
PERMISSION FROM IRB

INSTITUTIONAL REVIEW BOARD FOR HUMAN RESEARCH
APPROVAL LETTER for EXEMPT REVIEW

Steven Brundage
School of Music
813 Assembly Street
Columbia, SC 29208

This is to certify that the research study *An Investigative Study Measuring Self-Reported Metacognitive Habits Among Collegiate Pianists* (Pro00065248) was reviewed in accordance with 45 CFR 46.101(b)(2), the study received an exemption from Human Research Subject Regulations on 3/22/2017. No further action or Institutional Review Board (IRB) oversight is required, as long as the study remains the same. However, the Principal Investigator must inform the Office of Research Compliance of any changes in procedures involving human subjects. Changes to the current research study could result in a reclassification of the study and further review by the IRB.

Because this study was determined to be exempt from further IRB oversight, consent document(s), if applicable, are not stamped with an expiration date.

All research related records are to be retained for at least three (3) years after termination of the study.

The Office of Research Compliance is an administrative office that supports the University of South Carolina Institutional Review Board (USC IRB). If you have questions, contact Arlene McWhorter at arlenem@sc.edu or (803) 777-7095.

Sincerely,

Lisa M. Johnson
IRB Assistant Director
APPENDIX B
EMAIL PERMISSION FROM DR. JOSEPH RACKERS

 DMA dissertation study

RACKERS, JOSEPH <jrackers@mozart.sc.edu> Thu, Feb 9, 2017 at 10:03 AM
To: Steven Brundage <stevenphillipbrundage@gmail.com>

Dear Steven,

Thanks for your message. You are welcome to administer this study during jury exams.

You should know that DMA students do not give juries in Spring Semester (they only give one jury which occurs in Fall Semester of the first year).

Also, students that complete degree recitals do not have to play a jury. This means that the total number of graduate juries in the Spring will be limited. Probably between 5-10 people total.

Best,

Dr. Joseph Rackers
Associate Professor of Piano
Coordinator, Piano Area
Program Director
Southeastern Piano Festival
University of South Carolina
School of Music
803.777.0083
jrackers@mozart.sc.edu

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APPENDIX C
LETTER OF CONSENT

LETTER OF CONSENT
University of South Carolina
School of Music

AN INVESTIGATIVE STUDY MEASURING SELF-REPORTED METACOGNITIVE HABITS AMONG COLLEGIATE PIANO MAJORS

Steven P. Brundage, principal investigator

Completion and return of this form will constitute consent to participate in this research project.

You are invited to participate in a research study conducted by Steven P. Brundage, a graduate student in the School of Music at the University of South Carolina. The results of this study will be compiled in a dissertation in partial fulfillment of the requirements for the Doctor of Musical Arts degree in piano pedagogy. The purpose of this study is to measure self-reported metacognitive habits among collegiate piano majors. This form explains what you will be asked to do if you decide to participate in this study. Please read it carefully and feel free to ask any questions you like before you make a decision about participating.

Description of the Study

Participants will complete a pre-performance questionnaire prior to their piano jury performance. The duration of this questionnaire is approximately 5 minutes. Participants will perform their jury. Following the jury performance, participants will complete a self-evaluation form, the duration of which is approximately 1 minute.

Potential Risks and Discomforts

There are no anticipated risks to your participation.

Potential Benefits to Participants and/or Society

You may not directly benefit from your participation in this study, but this may assist you in preparing for future exams. In addition, this research may help us understand what types of instruction are effective in helping group piano students transpose at the keyboard.

Compensation for Participation

You will not be reimbursed for your time and participation in this study.

Confidentiality

Participation in this study will be confidential. A number will be assigned to each participant at the beginning of the project. This number will be used on project records rather than your name, and no one other than the researcher will be able to link your information with your name. Study records and data will be stored in locked filing cabinets and protected computer files owned by the researcher. The results of this study may be published or presented at professional meetings, but your identity will not be revealed.
Voluntary Participation

Participation in this study is voluntary. You are free not to participate or to withdraw at any time, for whatever reason, without negative consequences. In the event that you do withdraw from this study, the information you have already provided will be kept in a confidential manner. Your participation is not related to regular course work and participation or withdrawal will have no impact on grades.

Contact Persons

Participants may contact Steven Brundage at stevenphillipbrundage@gmail.com or (864) 905-4559 or Dr. Scott Price at sprice@mozart.sc.edu or (803) 777-1870 with questions about the study.

If you have any questions about your rights as a research participant, you may contact Thomas Coggins, Director, Office of Research Compliance, University of South Carolina, Columbia, SC 29208; Phone: (803) 777-7095; Fax: (803) 576-5589; Email: tcoggins@mailbox.sc.edu.

Consent

I have read the contents of this consent form and have been encouraged to ask questions. I have received answers to my questions. I give my consent to participate in this study, although I have been told that I may withdraw at any time without negative consequences. I have received a copy of this form for my records and future reference.

Signature of Participant _______________________________ Date ________________

Printed Name of Participant _______________________________ Researcher Signature _______________________________
APPENDIX D
PRETEST QUESTIONNAIRE

PRE-PERFORMANCE QUESTIONNAIRE

The purpose of this study is to measure self-reported metacognitive habits among collegiate piano majors. It investigates the degree to which participants comprehend and employ practice strategies, recognize their own strengths and weaknesses in learning and performing, accurately predict a performance outcome, and self-evaluate following a performance. This survey is voluntary and confidential. Participants do not have to answer any question he/she does not wish to answer.

The completed questionnaire should be returned to Steven Brundage.

You are being asked to participate in this study because you are an undergraduate or graduate piano major enrolled in applied lessons at the University of South Carolina School of Music. This questionnaire should take between five and ten minutes to complete. If you have any questions, please contact Steven Brundage at stevenphillipbrundage@gmail.com.

General Information

1. Name: ____________________________________________

2. Classification: ____________________________________________

3. Degree Program: ____________________________________________

4. How many years have you played the piano? ________________

5. How many years have you taken formal piano lessons? ________________

6. On average, how many days do you practice the piano each week? ________________

7. On average, how many minutes do you practice the piano each day? ________________

8. Out of a possible 32 points, what score do you anticipate receiving on your jury performance? ________________

9. Compared to other students performing jury examinations, in what percentile do you anticipate scoring? ________________
   (For example, if you believe that you will score higher than 40 percent of other students, then write “40.”)

A. Please read the following statements and circle the answer that best describes you.

   1 = Strongly Disagree  2 = Disagree  3 = Neither Agree nor Disagree  4 = Agree  5 = Strongly Agree

1. I know when I have correctly learned to play a piece of music.  1 2 3 4 5
2. I struggle to attain dependable memorization of my music.  1 2 3 4 5
3. When practicing alone, I do not perform well.  1 2 3 4 5
4. In lessons, I sometimes do not know what my teacher expects me to learn.  1 2 3 4 5
5. When I have finished practicing, I ask myself if I have improved.  1 2 3 4 5
6. When practicing, I do not utilize several methods to correct errors.  1 2 3 4 5
7. When practicing, I think about what I need to improve.  1 2 3 4 5
8. I play through repertoire until it is completely learned.  1 2 3 4 5
9. Depending on the problem, I use differing learning methods when practicing.  1 2 3 4 5
10. When in a piano lesson, I perform to my best ability.  1 2 3 4 5
11. I sometimes do not decide what I need to accomplish before starting practice.  1 2 3 4 5
12. When practicing, my mind sometimes wanders.  1 2 3 4 5
13. When memorizing, I play through my music until it is memorized.  1 2 3 4 5
14. When practicing, I ask myself if I am improving.  1 2 3 4 5
15. I am sometimes unaware when I have correctly learned to play something.  1 2 3 4 5
16. I am not able to perform well under pressure.  1 2 3 4 5
17. When being evaluated, I do not perform my best.  1 2 3 4 5
18. When practicing, I try using practice methods that have worked for me in the past.  1 2 3 4 5
19. I sometimes utilize learning strategies without thinking about them.

20. I cannot always attain dependable memorization of my music.

B.) Please describe three methods of learning that you utilize when practicing.

1. _________________________________________________________________

2. _________________________________________________________________

3. _________________________________________________________________
APPENDIX E
EVALUATION FORM

This evaluation form is being used as part of a dissertation study titled, "An Investigative Study Measuring Self-Reported Metacognitive Habits Among Collegiate Pianists." When completed, this form may be returned to the principal investigator, Steven Brundage (stevenphillipbrundage@gmail.com).

Name of Student: ____________________________________________

Please select the rating that best describes the student’s performance in the following areas:

<table>
<thead>
<tr>
<th>1 = Poor</th>
<th>2 = Fair</th>
<th>3 = Good</th>
<th>4 = Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Memory Control</td>
<td>1</td>
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<td>6. Dynamic Accuracy</td>
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<td>7. Tone Quality</td>
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<tr>
<td>8. Expressivity</td>
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APPENDIX F
SELF-EVALUATION FORM

This self-evaluation form is being used as part of a dissertation study titled, "An Investigative Study Measuring Self-Reported Metacognitive Habits Among Collegiate Pianists." When completed, this form may be returned to the principal investigator, Steven Brundage (stevenhillipbrundage@gmail.com).

Name of Student: ________________________________________________

Please select the rating that best describes your performance in the following areas:

<table>
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<th>1 = Poor</th>
<th>2 = Fair</th>
<th>3 = Good</th>
<th>4 = Excellent</th>
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