TESTING, TESTING, 1 2 3: EXPLORING THE MITIGATING EFFECTS OF SOUND
ON TEST PERFORMANCE

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EXPLORING THE MITIGATING EFFECTS OF SOUND

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ABSTRACT

Due to the amount of pressure put on students to perform well and the growing amount of standardized testing in the American Education system, there has been a dramatic increase in the identification and study of test anxiety and its impact on performance. Treatments of test anxiety are typically preventative in nature and focus on what can be done outside of the classroom on the part of the individual to improve performance. However, it may be more impactful to manipulate the actual testing environment on a larger scale. This study, through a 4 week within-subjects model, sought to explore these environmental manipulations through the inclusion of sound in the environment. Throughout this study participants were subjected to testing in silence, preferred, non-preferred, and ambient soundscapes. Test performance was significantly improved (by up to 22%) when participants were exposed to preferred music stimuli. However, performance is a complex phenomenon impacted by many different variables and more research should be done exploring how different cognitive factors impact performance.

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Testing has become the mantra in American education. This mantra is something that is supposed to provide an objective frame of evaluation which can be used to make sure educational goals are being reached, determine areas of weakness in an educational program, verify the retention of knowledge, and to provide summary judgment on determining the advancement of a student in the classroom (Patterson, Mattern, & Swerdzewski, 2012). As if the need to evaluate and compare students was not enough, testing is also used to evaluate a teachers and school programs as a whole. As a result, there is a lot of pressure to perform well from all aspects of the testing environment (both the student themselves and teachers) and students are showing signs of this stress as they are subjected to an adverse amount of stress to achieve high outcomes. In addition to this pressure to perform well, students are also being subjected to these types of high-pressure testing situations frequently. These frequent, high-pressure situations are resulting in higher levels of reported of performance anxiety which in turn becomes test anxiety. Test anxiety has been shown to adversely impact test performance (Kohn, 2000). However, it is very difficult to address test anxiety, especially in an environment where the stakes are so high. Many of the current approaches to treating test anxiety are time-consuming, effortful, and implemented on a person-by-person basis. However, even addressing small issues that help ameliorate anxiety can be very important in improving student performance. So, while personal and systemic factors that are currently being explored as a means to alleviate or mitigate test anxiety can be hard to control/alter, relatively minor features of the physical testing/learning environment such as the inclusion of sound may

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be easier to manipulate. However, before examining how the manipulation of the environment can be used to mitigate this kind of anxiety, specifically through the manipulation of music/sound/soundscape, it is important to first understand more specifically, how this anxiety originates, what anxiety is, and what is currently being done to treat it.

Testing in American Education

To fully understand the weight of the current testing system in the United States, it is first important to understand some of the history that created these high-stakes testing situations. With the need to compare students on their cognitive abilities, there has been an increasing focus on producing more tests that can easily compare students on a local, national, and global level. The solution to this need to compare has been found in the increased implementation and reliance on standardized testing to provide information to students, educators, and politicians on how the student is performing and whether or not that work is deemed satisfactory. One of the largest motivations for this increased testing is the need for academic comparison in the United States as a means of global comparison, making the testing outcomes more important than the actual learning. The United States has met this challenge of wanting to be a higher-ranking power in global education in terms of testing outcomes through a product first implemented in 2009 known as the Common Core.¹ In response to the current “ranking” of the United States in global education comparison, the chair of the National Governors Association(NGA) at the time, Janet Napolitano (a past Arizona Governor) had made the comment that

¹ The Common Core was developed by the National Governors’ Association (NGA) in 2008 as a response to the failed standards-based system administered under George W. Bush’s administration known as No Child Left Behind (NCLB)

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America did not have a globally competitive education system and this lessened our competitive edge as creative and inspired world innovators (Jerald, 2008). So, with the goal of making our students more competitive on a global scale, the NGA along with the Council of Chief State School Officers,² Achieve Inc,³ and the Bill and Melinda Gates Foundation set about to develop a new standards-based curriculum and assessment system for school-aged American students (i.e. the Common Core) in attempts to decrease the variability of the material taught in classrooms that decreases performance on standardized test (Bleiberg & West, 2014). The new curriculum provided teachers with itemized and scheduled lists for what things needed to be taught, how students should be instructed to learn this information, and what point in the year these things needed to be learned by (CPALMS, 2013). This new curriculum also came with a new set of tests for students that modified or even in some cases replaced what had currently existed in terms of standardized testing. Regardless, the main point of this program was to create increased testing scores through decreasing the amount of variability in classroom instruction with the implementation of a standardized curriculum.

Although there has been an increasing focus on the results of these examinations in the current American Education system as a means to make students more competitive on a global scale, the amount of testing now required may have a significant effect on student anxiety. In vying for these performance comparisons on a local, national, and global level, the amount of testing in American classrooms seems to have gone up with some students spending the equivalent of sixteen class days (96 hours) testing a year

² A non-partisan, non-profit organization of public officials in education used to discuss and reach majority consensus on educational issues

³ A bipartisan non-profit organization created to help raise academic standards, improve assessments, and increase accountability to prepare students for postsecondary success.

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(Hart, Casserly, Uzzell, Palacios, Corcoran, & Spurgeon, 2015). With this increased focus on testing as a result of time dedicated and need for comparison, teachers are being asked to modify their curriculum to match the standards presented on the tests to allow their students to perform better to try and resolve some of the student consequences. This forceful implementation of test-based curricula has not only had an impact on students, but also the energy and effort teachers put into (preparing for) testing. When asked to teach students to a prespecified curriculum, teachers have been shown to be more controlling, resulting in students having less choice and autonomy in their own education (Deci, Spiegel, Ryan, Koestner, & Kauffman, 1982). With less autonomy in their own education, students are subject to a lot more stress because the motivation to learn is now extrinsic and in many cases being forced upon them by teachers and schools in their attempts to seem high achieving and obtain accolades (August, 2015). These stressors encountered by students are especially present when observing the consequences of underperforming on the newly implemented standardized tests. The consequences of underperforming include the loss of monetary reward (in the form of scholarships or school grants), lack of academic advancement (to be competitive in a global job market or simply the advancement from class to class or grade to grade), or even potential risks to the student's social status/standing among peers accompanied by a lowering of self-esteem (Kearns, 2011). On top of the pressure instilled in students by these consequences potentially brought about by older adults [parents], educators, and political figures for students to appear to outrank one another in either a local or global scale, students are also exerting pressure on each other to outperform one another (Crouzevialle & Butera,

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2017), bringing competition to an even more local form and thus, making any kind of treatment to test anxiety an even more pressing problem.

The controversy over the Common Core generated a lot of media attention because of its radical ideas and changes in the testing system. As mentioned above, there was a desire to make the American education system more competitive globally, and therefore the impact of testing in these large-scale systems in the United States had political underpinnings which were accompanied/inspired by business plans that tied the students' performance of these assessments to teachers' salaries and careers. This was politically based on the global need to say that American students are the best, brightest, and most qualified candidates on a global scale and job market. The potential consequences of underperforming (for the teacher/school/region/county) created a climate of fear in the schools which, in turn, could be passed on to the student in the classroom. This increased pressure on students to perform by the needs of the Common Core system and all of the consequences that accompany it creates a climate in which students are more prone to demonstrate characteristics of anxiety in response. This increased pressure that is producing test anxiety in students is something that has been and is currently heavily reflected in the media (August, 2015; Jones et al., 1999; Karp, 2013). Leading to the question, if we know that putting more pressure on students to perform well will increase the rate at which they experience test anxiety, why do we continue to do it in attempts to boost test performance? However, knowing that anxiety is being produced as a result of this pressure is not enough for holistic understanding, we must also understand different cognitive aspects of the testing environment and how anxiety can be produced as a result of things outside of this externalized pressure being

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placed on students. Anxiety is a complicated and multifaceted phenomenon that impacts performance in a lot of different, nuanced, and interesting ways, so it's important to understand how it can be brought about in both a social and cognitive context.

Exploring Cognitive Factors that Impact Learning

In education, attention, which can be assessed by measuring student learning in testing, is often under harsh scrutiny. Attention is typically categorized by a few different cognitive facets such as alertness, orienting, and executive functions. Alertness allows people to be in the moment and is often driven by the circadian rhythms of the body (it's like the warning signal), orienting is what allows people to prioritize certain tasks over others also known as the decided allocation of mental resources, and executive functions allow people to have focal attention to focus on one item at a time (Peterson & Posner, 2012). In short, these cognitive factors can be understood as the location, allocation, and distribution of mental resources, and if one of these things are negatively disrupted, student learning and performance can be severely impacted. For example, when people are presented with a distraction in the same domain as the task they are supposed to be attending to, such as trying to attend to two different auditory stimuli at the same time, performance suffers because attention is split between the two activities and more focus/attention cannot be given to one or the other (Gil-Gmez, Stablum, & Umit, 2016). In other words, in attempting to place the same amount of active energy towards both tasks (or trying to accomplish two related tasks at the same time), students are diminishing their available resources and making it more difficult for them to perform well in either task (an error in orientation leading to errors in executive function). However, these cognitive facets of attention are most easily applied to the individual

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student in the process of learning or completing a task and may not be the sole factor influencing student attention and knowledge.

Sometimes it is important to think of attention as a social behavior to be contextualized within the actual classroom setting. To observe this, classroom engagement must be explored. There are three different types of engagement: (1) emotional engagement which is defined as positive and negative reactions to people in the environment, the physical school environment, and the material being covered, (2) behavioral engagement which is described as being related to participation, specifically the other types of activities that keep students in school (extracurriculars/friends/etc.), and (3) cognitive engagement which is the concept of investment in education characterized through the willingness to exert effort to learn (Fredricks, Blumenfeld, & Paris, 2004). So, different types of engagement and the amount of social space they occupy can either mitigate or inhibit testing/learning behaviors depending on the positive or negative valence of the situation. In fact, positive/high classroom engagement has been positively linked to improving critical thinking skills and grades, which may also produce better test performance (Carini, Kuh, & Klein, 2006). However, when administrators, teachers, and students are surrounded by the stress of high-stakes testing, the ability to engage and concentrate can be severely inhibited (and this may be due to the development of test anxiety), making examining factors related to engagement even more important.

In a classroom-based situational example, if a student cannot focus or “pay attention” in class both in terms of a more situational distraction (such as daydreaming or working on an off-task activity) or experiencing a cognitive deficit (such as ADHD), it is

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usually unlikely that the student will perform well on tests (Frazier, Demaree, & Youngstrom, 2004). In some cases, these issues with attention can be caused by the stress of upcoming examinations and this is likely to be the case with the implementation of the highly pressurized and frequent test of the Common Core (Spector, 2015; August, 2015; Karp, 2013). To fully understand how anxiety interacts with these cognitive systems of attention and by default learning, it may be useful to examine exactly what test anxiety is and does and how it can be treated.

What is test anxiety?

Acknowledging that testing is such a large component of American education, test anxiety and the things that occur because of it are under more inspection. Although many people are aware that certain types of pressures can drive poor performance, fewer are aware that many of these outcomes are driven by test anxiety or what test anxiety is. Originally, in educational psychology literature, test anxiety had been defined in a couple different ways. Primarily it was defined descriptively in terms of the individual student who had a higher fear of failure than motivation to succeed (Mandler & Sarason, 1952). However, some researchers sought to find a definition that characterized both the physiological and psychological symptomatology that characterized this kind of anxiety and determined test anxiety as being linked to feelings of inadequacy, helplessness, heightened somatic reaction (heart racing/sweating), and anticipations of punishment or loss of status and esteem (Hembry, 1988). However, more recently the term has shifted to be more broadly characterized by the facets of emotionality and worry (in some cases it is even more heavily linked to the larger umbrella of anxiety disorders/trait anxiety). Emotionality in this newer characterization dbeing more specifically defined as the

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affective state that typically produces the physiological symptoms (such as the previously mentioned characteristics), and worry being defined as the cognitive reactions to anxiety that inhibit learning (in terms of attention and focus) or the retrieval of knowledge (Numan & Hasan, 2017). Although these characteristics seem fairly unambiguous and straightforward, there is not a simple solution to counteract or explain these behaviors. Many factors are involved and go into creating test anxiety and in turn, test anxiety may not have an explicitly direct impact on behavior-the relationship may be more complicated. and This nuanced explanation of anxiety is s so nuanced and different from person to person and there has been a lot of work looking into how to individually treat or identify this issue. However, in order to suggest potential solutions, we must first understand what behaviors and processes can be impacted by anxiety produced by testing. More specifically, we must understand how facets of worry and emotionality can manifest in learning and test taking.

How is Test Anxiety Treated?

Test anxiety has been shown to be linked to a variety of physical, emotional, and cognitive behavioral symptoms, but due to the diversity of symptoms it is typically treated on an individual and preventative basis. Many of these symptoms are believed to be linked to things such as negative self-talk, expectancy bias, under-preparedness, and the exorbitant amount of pressure placed on students to succeed to advance in their schooling/life. However, the explicit cause or source of anxiety if difficult to parse, and this issue is made even more difficult with each individual student's unique set of circumstances and situations. Therefore, much of the work done to try and mitigate this anxiety is focused in a trial-by-fire type experiment to see which "strategies" can be used

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to alleviate the symptomatology of anxiety for each individual student and is focused on being preventative rather than providing immediate relief.

Traditional treatments of test anxiety include but are not limited to: teaching students to use progressive muscle relaxation (Goldfried & Davison, 1994), using guided imagery for self-desensitization (Sapp, 1994), using techniques to recognize and go against irrational thoughts (Ellis, 1985), and training in study and test-taking skills by doing things such as pacing yourself, studying alone for 45 minutes at a time, and associating these activities with positive rewards. The majority of the strategies currently provided to help mitigate some of the effects of test anxiety are focused on similar things such as stress and time management on the individual level. In fact, a simple google search for “ways to get rid of test anxiety” yields a variety of top ten lists on ways to deal with anxiety ranging from 3 part systems reducing anxiety through studying (McDonald, 2001), physical wellbeing (McAuley, Mihalko, & Bane, 1996), and isolation and removal of negative thoughts (mental) to various time management and stress reduction techniques (Young, 1991). However, all of these tips still seem to be aimed at reducing anxiety outside of the actual testing environment even though the actual testing environment historically and presently seems to play a large role in creating these situations in which performance anxiety is high. So, because anxiety is still treated based on symptomatology in a case by case basis after the occurrence of the primary event in attempts to help prevent future occurrences to varying degrees of success,⁴ it may be increasingly important to examine manipulations of the actual testing environment to treat test anxiety.

⁴ Because the implementation of these strategies is reliant on the individuals own desire and is something that occurs outside of the primary classroom environment.

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Recognizing that anxiety is mostly treated after it has been exhibited makes sense, but in these high-stress situations that manifest through testing in the modern-day American schooling system, students are very likely to be exhibiting more performance anxiety regardless of having exhibited previous symptomatology. In fact, the amount of observed test anxiety appears to be going up in American school-aged students (McDonald, 2010). Due to this finding, it is not completely unreasonable that there be ways to mitigate anxiety within the actual testing environment instead of focusing on things that can be done outside of the classroom to reduce anxiety. As previously mentioned, the physical environment in its orientation, the collection of people, and auditory landscape may be another source of anxiety, especially when the tension felt by students and teachers on testing days may be palpable (as evidenced through the increasing reliance on standardized testing). In searching for ways to reduce these feelings instigated by the classroom and increased testing situations, it may be a good opportunity to explore manipulations of the physical environment as a means for treating and dealing with anxiety as it is not only more physically available, but also potentially an easier and more cost effective way to treat these kinds of issues on a larger scale (the whole classroom) as it doesn't rely on the initiative of the individual student or families to deal with these issues (if the student is not performing well).

The Environment and Anxiety

testing environment in its explicit physical being (social pressures, physical layout, and auditory landscape) and mental implications (i.e. the stress and pressure being placed on students) has been shown to be one of the strongest components in eliciting test anxiety (Cassady & Johnson, 2002; Asghari, Kadir, Elias, & Baba, 2012). The classroom

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is often influenced by external factors such as the physical environment which can be characterized by sensory information such as visual, olfactory, and auditory fields. Classrooms are a rich source of information both regarding actively attended to obtained information such as the material being taught by the teacher and passively attended to information, such as a video that drones in the background of a conversation between students. Although a classroom provides an environment in which students are expected to pay attention and learn, there are a lot of other components in the classroom that may impact the learner's attention/focus. Within a classroom, there may be other talking/sounds, harsh lighting, or the distraction of trying to sort out one's interpersonal relationships. In fact, the maintenance of interpersonal relationships has actually been shown to diminish the ability to retain or obtain knowledge (McFadyen & Cannella, 2004). These characteristics are some of the factors that can impact how a student performs in a variety of tasks, but with the increase in school testing, testing environments are of special importance in understanding how students test. Even more important to this understanding though is understanding ways in which the learning or testing environment can elicit anxiety.

The manipulation of the environment may be one of the easiest ways to impact test anxiety and performance on a larger-within classroom scale. In addition to the simplicity of these kinds of environmental manipulations, they are also significantly less costly on the part of the individual student's time because environmental manipulations can be implemented within and during the actual testing environment/session and does not need to be completed by the individual beforehand. Something of particular interest in manipulating these testing environments, and one of the simplest and cheapest ways to

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greatly impact performance is through the inclusion of sound in the environment, an idea better identified through the term soundscape. Soundscape is a term described by music educator, R. Murray Schafer (1994) as a sound or combination of sounds that forms or arises from an environment. These sounds in the soundscape include but are not limited to speech, classroom movement/ambient classroom sounds (rustling of papers, scratching of writing utensils, etc.), and the inclusion (or exclusion) of music in the classroom. Sound has been shown to impact people cognitively, emotionally, and behaviorally (Kampfe, Sedlmeir, & Renkewitz, 2011) and all three of these components have been linked to education, learning, and testing whether that be inhibiting or improving these activities. However, it might be interesting to explore how sound can be linked more directly to testing.

As stated previously the implementation of sound in the classroom has been shown to have positive effects in some cases, and negative effects in others. In their 2017 study, Bell, Rer, Marsh, Storch, and Buchner looked at the impact of forewarning participants of potential auditory distractions to their future cognitive performance because prior research had shown additional stimuli inhibits task performance. In fact, in attempts to mitigate some of these sound effects, noise reducing headphones have been used and shown to improve classroom performance in some cases (Smith & Riccomini, 2013). However, in response to their study Bell et al. found that when warned, participants performed better on the cognitive tasks. However, some studies have also purposefully utilized sound in the form of music to improve/impart learning, suggesting that in some cases, sound is not a hindrance. According to a study by Ferrer, Lew, Jung, Janeke, Garcia, Peng, and Tam (2014), music was shown to reduce classroom stress.

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Connectedness of sound to emotions is one of particular importance in approaching the problem of test anxiety, and many studies have demonstrated that music is very much connected to people's emotions. Sounds have also been used to increase mindfulness and ability to perform spatial reasoning tasks (Bell, McIntyre, & Hadley, 2016). However, the type of sound makes a rather large difference in the learning process. For example, Thompson, Schellenberg, and Letnic's 2012 study demonstrated that if music is fast and played loudly, it can hinder task performance in reading comprehension. Although sound has been shown to mitigate classroom stress, classroom attention and focus is a little more complex and requires a bit more exploration.

So, because the inclusion of sound in the classroom has been shown to have positive and negative effects, there has been some debate as to which components of music/sound should be studied in conjunction with education and the general knowledge of what music has done/can do. Behaviorally, music has been linked to rhythmic entrainment, suggesting that faster music can also drive faster temporal behavior when under cognitive load (Maes, Giacofci, & Leman, 2015). However, louder sounds have been linked to task distraction and particularly linked to issues with reading comprehension (Thompson, Schellenberg, & Letnic, 2012). Although music/sound has been shown in some cases to drive behavior and in other cases, inhibit memory, these types of behaviors seem to be mediated by an overarching factor of participant emotionality, which is not necessarily a factor of sound, but does influence how sounds are perceived. Music and sound have been shown to have an impact on a person's affective state (McCraty, Barrios-Choplin, Atkinson, & Tomasino, 1998) and younger people have been shown to be more impacted by these sound mediated mood changes

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produced through music (Pearce & Halpern, 2015). These sounds/music can make people happy, sad, angry, or calm and people will often make selections of what they want to listen to based on how they are feeling (Lee, Andrade, & Palmer, 2013). If people are making selections of what they want to listen to through the lens of their affective state, it is not a huge leap to consider the idea that a person's emotional state may also impact their cognition, and by default, their testing performance and this has been shown to be true through the arousal-mood hypothesis, which is the idea that mood impacts cognitive performance (Husain, Thompson, & Schellenberg, 2002). In particular, younger peoples' increased song-congruent emotionality may have an impact on their anxiety levels and therefore their testing.

So, personality, mood, and physical environment can all be linked to the way a student performs both physiologically and cognitively in the classroom. Music has also been shown to either effect or be reflective of an individual's personality, mood, or interaction with their physical environment. As relatedness to sound seems to be a growing field of research in terms of understanding a person's performance and behavior, psychological research has been exploring how sound is being used to manipulate cognition and, in some cases, explicit learning.⁵ However, the utilization of sounds in the context of cognitive manipulation have mostly been examined in the context of consciously/actively observed soundscapes in specific genres through the explicit utilization of certain types of music (i.e., the Mozart effect (Rauscher, Shaw, & Ky, 1995)). Less well studied, but potentially very important, is the use and effect of soundscapes in settings where specific sets of sounds are not intended to be the primary

⁵ Music has been used to support literacy and fluency in ELL students (Paquette & Rieg, 2008).

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focus but rather the feelings evoked from sounds, such as in situations like classroom testing environments. These sounds can serve as either background noise eliciting anxiety (or distracting from it) or potentially supportive features of an academic environment making students feel good, driving their rhythmic performance, and increasing the ability to focus on the task at hand.

The Current Study

Academic environments, specifically in the case of performance environments, such as classroom and testing situations, where some students, if not all are known to face a certain amount of evaluation based anxiety from the amount of pressure placed on them to perform well, are situations in which it is important to understand the value of classroom mood (specifically in the case of anxiety) and ways that these situations can be mitigated. Classroom mood and environment are constructed by a combination of cognitive, emotional, and physical factors, and test anxiety has been shown to be affected by all of these things. However, when discussing test anxiety, the majority of the tools used to mitigate this anxiety-related symptomatology is done prior to entering the testing environment instead of within the actual pressure-driven classroom or testing setting. Although there has been research connecting different music preferences to different personalities (Carlson, Saari, Burger, & Toiviainen, 2017), music to mood (Ferguson & Sheldon, 2013), and music to better on-task class performance (Davidson & Powel, 1986), there has been little research explicitly connecting specific self-selected genre preferences to on-task performance and classroom mood in a classroom setting.

This lack of focus on the actual testing environment and increased focus on student test performance outcomes may be contributing to the increased reporting of

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anxiety in current school-aged students. Music has been shown to have an impact on a person's cognitive ability outside of explicit conscious awareness (Noseworthy & Finlay, 2009), but has not been explored in this way when it comes to a classroom environment and mood (specifically in the recognition of test anxiety). So, the mood-congruent properties of music and sound on younger people (potentially school aged people) may be an interesting avenue into exploring how we can manipulate a testing environment to lessen anxiety and improve performance. So, this study seeks to not only examine how different kinds of sounds impact mood, but also explore how these sounds, in the form of ambient sounds and preferred/non-preferred music impacts classroom performance, and more specifically test anxiety through a combined understanding of the cognitive and emotional effects of music on behavior.

The focus of this study is examining factors that pertain to cognitive focus through an emotional lens evaluated by looking at how a non-explicitly referenced/displayed specific sound environment or soundscape impacts and/or distracts from cognitive performance through the influential component of mood. In this study, the arousal-mood hypothesis (Husain et al., 2002), which links mood, music/sound, and cognitive performance will be examined as a means to mitigate some of the test anxiety within a testing environment. So, if music preference has been shown to impact a person's mood, and through the arousal-mood hypothesis we know that mood impacts cognitive performance, to what extent can music (when it is self-selected to a person's likes or dislikes) be used to impact and possibly improve cognitive performance in an in-class/testing environment? To what extent does one's soundscape impact affect

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management in classroom settings and how do these emotions produced by students impact performance if they do have an impact?

Preferred music in comparison to other non-preferred sound conditions has been shown to have a greater positive impact on affect management (Kemper & Danhauer, 2005). This type of positive mood modulation produced by listening to preferred sound stimuli could greatly impact task/cognitive performance. The current study assessed the potentially mitigating factors of preferred and non-preferred music on test anxiety through a 4-week within-subjects design in which participants completed a reading comprehension task under a silence, ambient/classroom sounds, preferred, and non-preferred music condition (each week is a different sound condition). For this study, participants were assessed for their anxiety and cognitive performance (in terms of questions attempted and questions answered correctly). Under the premise of the arousal-mood hypothesis and literature pertaining to anxiety, mood control, and sounds in test/cognitive assessment conditions the following hypotheses are considered: (H1) the various soundscapes will have some impact on test performance, (H2) higher anxiety will be related to lower performance scores, (H3) the preferred music condition will yield better test performance than the other sound conditions, and (H4) the preferred music condition will decrease anxiety. The results of this study may yield a better understanding on how the manipulation of testing environments (which are often not consciously attended to) can impact performance and mood as well as further the understanding of what test anxiety is and alternative ways to treat it through environmental controls rather than pre-assessment preparatory skills.

Methods

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Participants

Data was gathered from 13 participants at a small liberal arts college over the course of four weeks (8 female, 2 male, 3 non-binary, age 18-28; mean age 20.33).

Participants were recruited through an email sent to a student email listserv at a small liberal arts college in Sarasota, Florida. Participants were asked to return for testing once a week for four weeks and given a \$20 gift card at the end of the four-week testing period to a location of their choosing. After the four-week testing period, 11 participants remained with all four weeks of data. In order to take part in the study, participants had to be over the age of 18, have the ability to hear, and be literate. Prior to participating in the study, participants were asked to sign a consent form acknowledging that they would be completing testing tasks under various sound conditions as well as acknowledge they were over 18, were literate, and could hear.

Materials

The current study consisted of a pre-test music preferences measure (of which the genre selections were adapted from the Revised Short Test of Musical Preferences (STOMP-R) (Rentfrow & Gosling, 2009)), four separate sound conditions, a set of pre-established SAT reading comprehension tasks, an anxiety measure, and a relatedness to music measure (Music Experiences Questionnaire). The sound conditions were as follows: a silence condition in which no sound was played and the only noise in the room was the sound of the student testing or any other randomly occurring background noises, a most preferred music condition in which music in the genre that corresponded to each individual participant's marked preference was played (preference was determined through the pre-test measure), a least preferred music condition in which music in the

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genre that corresponded to each individual participant's least preferred marked preference (what they liked the least) was played (lack of preference determined by the pre-test measure), and an ambient sound condition in which general classroom sounds such as the sounds of pencils, rustling papers, and whispers were played.

In order to determine participants most preferred and least preferred genre selections, participants were administered a survey assessing their musical genre preferences through a Google form based on the STOMP-R (Rentfrow & Gosling, 2009). The original STOMP-R assessed 23 genre preferences on a seven-point Likert scale (1 being dislike strongly and 7 being like strongly). The modified STOMP-R utilized in this experiment consisted of the same 23 genres but instead of a likert scale, participants were only asked to select their most preferred and least preferred genres (this was separated into 2 separate questions with the same 23 genres listed, one list was for most preferred and one list was for least preferred- both lists had the same 23 genres listed) (see appendix A for representation). After selection, participants had selected 14 different genres as their most preferred and least preferred genres (7 most preferred: Rock, Alternative, Classical, Oldies, Pop, International, and Soul/R&B; 7 least preferred: Blues, Country, Religious, Heavy Metal, Bluegrass, Punk, and Opera; see appendix B for full genre definitions and search terms). From these selections, 12 minutes of music within each genre was selected for participant listening (7 minutes of music for the task, 2 minutes of cushion before the task began and 3 minutes after for music to continue playing as the participant completed the post-test anxiety measure). To be selected, music had to be instrumental, around 120-130 bpm (beats per minute), include the name of the genre in the title (excluding classical, oldies, international, and religious which were

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selected from the operationalized definitions), and utilize characteristics of the genre as defined by the researcher in various web-based searches for genre analysis (genre theory is highly conflicting and difficult to parse as some people distinguish genre from style and some do not (Horn, 2012; van der Merwe, 1989)). Instrumental music as opposed to lyrical music was shown not to be as confusing to listen to while completing other task (Kang & Lakshmanan, 2017). Rhythmic entrainment (the ability to match pace to another track) to music was shown to work best between 106-130 bpm and a normal walking pace was around 120 bpm (Styns, van Noorden, Moelants, & Leman, 2007), so music for this study had to be around 120-130 bpm. All musical samples were obtained through Youtube on compilation videos that were at least 2 hours in length for continuity in music selection and the avoidance of advertisements⁶ (excluding opera and bluegrass as other samples that fit the previous specifications were not found). Other requirements for music selection were that there were at least 1000 views on the video and that it met the definitions for the genre as provided by the researcher. For the ambient sound condition, the selection was ASMR study sounds. ASMR stands for autonomous sensory meridian response which is essentially the idea that the sounds experienced in the video stimulate a tingling sensation as if a person was experiencing the actions being performed which in this case, the sounds were mimicking being in a classroom. Music/sounds were played off of the researchers laptop located directly across from the participant at a volume level of 48 out of 100 (approximately 65 decibels-just above normal speaking volume).

The reading comprehension tasks ranged in length from 85 to approximately 90 lines long with 10 questions each. For this study, eight separate reading tasks were

⁶ On the free version of Youtube, it shows you where advertisements will occur in longer videos, and by selecting longer videos, you can select sections where there will not be advertisements.

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selected from the 2015 SAT practice test set posted by The College Board (for exact tasks, see appendix C). SAT reading comprehension tasks were selected as they were deemed to be of equal difficulty and had shown validity in predicting task comprehension through correct completion. Criterion for selection was length (close to 90 lines of text), fictional content, and varied subject matter (selections could not be on the same or similar topics). Of the eight reading comprehension tasks that were selected for this study, participants were given 2 of these tasks a week, a longer one (closer to the 90 lines) and a shorter one (closer to the 85 lines). Both tasks were shown to take approximately the same amount of time to complete in pilot testing, so the order of the tasks (short than long) were kept constant across weeks.

In addition to the reading comprehension tasks, a measure of anxiety was taken through a new measure based off of the Hamilton Anxiety Scale (Hamilton, 1959) and the Westside Test Anxiety Scale (Driscoll, 2007) to combine facets of anxiety particular to test anxiety and generalized anxiety (see appendix D for full measure). The original scales consisted of statements that described facets of either generalized anxiety (the Hamilton Scale was more psychiatrically/medically loaded looking more at physical attributes) or anxiety elicited by testing (the Driscoll Scale described some of the cognitive effects that test anxiety elicits). This new measure consisted of eight single word statements relating the participants current mood in which the participant would rank on a five-point scale how much or little their current mood aligned with the statement/word (5 being very much, 1 being not at all). Single word statements were used as a means to abstractly (allowing participants to make their own associations with the terms instead of providing them with definitions) obtain scores on participant anxiety

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without loading it to be more physical (such as the Hamilton Scale) or mental (such as the Driscoll Scale). The new measure was meant to get at participant evaluations of both physical and mental aspects of anxiety. Example items include words such as “worried” or “irritable.” This measure was administered before the first reading comprehension task and after the second task each week. Items 2, 7, and 10 were reverse scored (words such as “confident” or “excited”). To measure anxiety, scores were recorded and added together to create a composite anxiety score (maximum possible score of 40). Because anxiety was measured before and after testing, actual anxiety scores were assessed in terms of the difference between post-test and pre-test scores (i.e. if there was an increase or decrease in anxiety after the second round of testing).

The last component of the current study was the Musical Experiences Questionnaire (MEQ) to assess connectedness to music/musicianship as high connectedness to music/musicianship has been related to better task performance in comparison to average or low connectedness (Werner, Swope, & Heide, 2006; for full survey, see appendix E). So, people who are very connected to music or musicianship may react differently to music tracks being played than those who are less connected to music or musicianship. The questionnaire includes 53 questions ranging from “Music can influence my emotions” to “I love some kinds of music” that are ranked on a five-point Likert scale with 1 being “very untrue” and 5 being “very true” (3 being “neither true nor untrue”). The questionnaire was meant to evaluate the following components: commitment to music (7 items), innovative musical aptitude (7 items), social uplift (4 items), affective reactions (10 items), positive psychotropic effects (16 items), and reactive musical behavior (9 items). Items 5, 10, 12, 20, 33, 34, and 45 were reverse

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scored as a means to assess participant fatigue as well as participant emotionality (all reverse scored items except item 10 were assessing affective reactions). Scores were added together to create a composite score with higher scores suggesting higher relatedness to music. Scores on connectedness to music were then assessed on a percentage basis (taking the composite score by participants and dividing them by the total possible score of 265).

Procedure

For this within-subjects repeated measures study, participants were informed via email that they would be asked to return to the testing site (a small, quiet, and secluded room set with tables where the researcher would sit directly across from the participant whilst administering the testing tasks) once a week for four weeks. In this email, participants were also linked to a Google form where they were asked to indicate their most preferred and least preferred music genres (in the form of the modified STOMP-R) and this was recorded along with their contact information (in the form of a name and email address) and basic demographics (age and gender). Their recorded preferences were then used by the researcher to select the most and least preferred music for the sound conditions in weeks two and three of the study for each individual participant.

Each week participants were exposed to one of four sound conditions until they had successfully completed all four of the conditions. Participants completed one sound condition a week. The sound conditions that participants experienced were silence, most preferred music according to participant individual selection (each participant self-selected their most preferred genre), least preferred music also according to the individual participant's self-selection, and ambient/classroom sounds. The sound conditions were

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presented as follows: week one: silence, week two: most preferred music, week three: least preferred music, and week four: ambient sound. However, participants were not made aware of what music/sound condition they were getting, they were just informed that sounds/music would be present. Each week the participant would come in and complete two reading comprehension tasks. The first reading comprehension task each week would be completed in silence to obtain a baseline level of anxiety and score (in terms of questions attempted and question accuracy) for the week and the second reading comprehension task would be completed in one of the four different sound conditions. The first week participants completed both reading comprehension tasks in silence as a means to assess baseline performance.

At the start of each session, participants were first asked to complete a pretest measure for anxiety. Participants were instructed to answer this survey in regard to their current emotional state and given an example by the researcher (i.e. “I am feeling very energetic, so I would circle a 5”). After completing this pretest measure for anxiety, participants were read the following instructions regarding the first of the upcoming two reading comprehension assessments/tasks:

You will now be asked to complete a brief assessment. You will have seven minutes to complete this assessment and you can start as soon as I hand you this packet. This assessment consists of a passage followed by 10 questions. Please do your best to complete this assessment. When you are ready to begin please indicate by saying ok and I will hand you the packet and start the time. Once again, you will have seven minutes to complete this assessment.

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The emphasis on the seven-minute time block was given as a means to increase the urgency for this task, because studies have shown that using a time limit can induce anxiety (Onwuegbuzie & Seaman, 1995). After hearing these instructions, participants were given seven minutes to read and answer the questions on the first reading comprehension task. Once the first reading comprehension task was completed (or participants ran out of time), participants were given one minute to rest as the researcher set up the next activity (in weeks 2-4 this time was used to load the sound conditions). Participants were given the same set of instructions again for the second reading comprehension task of the week, only this time it was prefaced with the researcher saying, "I'm interested in how sound impacts testing, so there will be some music/sound in the background." In the least and most preferred music condition weeks, music started during in the pre-test instructions, in the ambient sound week, sound was started in the pre-test instructions, in the silence week, no sound or music was played. After the introduction of sound (if sound was required), participants were then once again given seven minutes to read and answer the questions on the second reading comprehension task. The reading comprehension tasks in both instances of each testing week were scored for accuracy (answers correct) and amount of questions attempted. After completing both reading comprehension tasks for that week, participants were asked to complete a post-test measure for anxiety, thanked for their participation, and asked to schedule their time for the next week. On the fourth and final week of the study, after the completion of both reading tasks and the post-test measure for anxiety, participants were asked to complete the Musical Experiences Questionnaire (MEQ) to get a sense of their connectedness to music/musicianship. After completing the MEQ at the end of their last session,

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participants were then thanked and debriefed on the purpose of this study, stating that this study was examining sound as a way to alleviate test anxiety and that their scores will be used as a means to examine the effectiveness of different soundscapes on mitigating this anxiety. Participants were also provided with the researcher's information should they have any further questions or concerns and thanked with a \$20 gift-card to a location of their choosing.

Data Cleaning and Analyses

This study measured participant performance in the second testing session by examining baseline performance scores (performance in both testing sessions were defined by percentage of questions correct divided by the amount of questions attempted), anxiety difference between a pre and post-tests as defined by the difference in anxiety scores between time one and time two (T2 anxiety-T1 anxiety),⁷ and sound condition in a four-week within subjects ($N=13$), repeated measures design. The model for examining performance is depicted in the following equation:

$$\text{Secondary Test Performance} = \text{Baseline Performance} * \text{Sound Condition} * \text{Anxiety Difference}$$

After completion of the four-week testing period 11 participants had completed all four testing sessions. Of the two participants who did not complete all four weeks, one had completed only the first week baseline and was not included in final analysis and the other had completed three of the four sound conditions (only missing the ambient sound condition) and was included in final analysis ($n=12$). Of the 11 who completed all four

⁷ Negative difference scores denoted a decrease in anxiety and positive scores denoted an increase.

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weeks, connectedness to music (as determined by the MEQ) was also assessed and recorded as descriptive statistics to be viewed exploratorily in conjunction with final analysis of performance. However, the initial model in the ANOVA examined performance accuracy (in the second test during the session—the dependent variable) as a product of the interaction between sound condition, baseline test performance/accuracy, and participant anxiety difference (the independent variables).⁸ Connectedness to music was only added to the independent variables in the model exploratorily afterwards.

To determine if sound condition, participant anxiety difference and baseline test performance/accuracy had an impact on test performance/accuracy in the experimental condition ($n=12$), a one way-repeated measures ANOVA with interaction terms was run in the open access R statistical package (Team, 2013), specifically utilizing the type III ANOVA tools from the “car”⁹ package (Fox, Weisberg, & Price 2018). For the purposes of this model alternative performance and anxiety scores were calculated from the original data. Participant performance scores in both the baseline (test 1) and experimental (test 2) conditions were calculated from dividing the amount of questions correct by the amount of questions attempted in each test (each participant for final analysis had 4 baseline scores and 4 experimental scores; 2 scores (baseline and experimental) per participant per sound condition). Participant baseline and post-test anxiety scores were placed into the model as the difference between post-test and pre-test anxiety (Post - Pre) and will be referred to from now on as anxiety difference. The final model evaluated how the interaction between sound condition, anxiety difference, and

⁸ See aforementioned model for a visual depiction of this equation.

⁹ Companion to Applied Regression Package

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baseline performance (independent variables) impacted secondary test performance (dependent variable) (as demonstrated in the aforementioned equation). In addition to the ANOVA with interactions, a number of post-hoc exploratory tests were run to examine the specific interactions of different variables such as performance by sound condition, anxiety by sound condition, and multivariate models holding either sound condition or baseline performance constant while exploring the impact of anxiety differences on secondary/experimental test performance. All of these results and explorations can be found in either the results section or supplementary appendices.

Results

To understand of how these factors (anxiety difference, sound condition, and baseline test performance/accuracy) influenced experimental test performance/accuracy, a one-way within subject d ANOVA with interactions was run.

Soundscape and Performance

In terms of the first hypothesis regarding the impact of the sound conditions/soundscapes on cognitive performance, there was a significant main effect found for sound condition on performance (in the experimental testing condition), $F(3, 28) = 4.49, p = .01$, and a significant interaction between baseline test accuracy and sound condition on the test performance in the second session (experimental testing session), $F(3, 29) = 3.343, p = .01$. To determine which sound conditions yielded significant differences in task accuracy post-hoc a few paired-samples t-test were run to compare the means of the various sound conditions (see figure 1 for a graphical representation of the mean distribution of scores across sound conditions/soundscapes).

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Figure 1. A bar graph representing the differences in test accuracy (in percentages; on the y-axis) across sound conditions (on the x-axis). Students could not get higher than 100% (1) accuracy.

There was a significant difference in the test accuracy scores for preferred ($M = .89$, $SD = .12$) and non-preferred ($M = .67$, $SD = .24$) sound conditions/soundscapes; $t(11) = 3.17$, $p = .009$. There was also a significant difference in the test accuracy scores for preferred ($M = .89$, $SD = .12$) and ambient ($M = .70$, $SD = .18$) sound conditions/soundscapes; $t(10) = 2.91$, $p = .015$. However, there was not a significant difference in the test accuracy scores for preferred ($M = .89$, $SD = .12$) and silence ($M = .797$, $SD = .19$) sound conditions/soundscapes; $t(11) = 1.79$, $p = .102$.¹⁰

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¹⁰ This was only found non-significant in a two-tailed test. In a one-tailed directional test, participants did significantly better in the preferred music/sound condition.

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In terms of the impact of participant anxiety difference (if there was an increase or decrease in anxiety from time one to time two) on test performance, there was not a significant main effect found, $F(1, 30) = 2.37, p = .13$ (see figure 2 for a graphic representation of this effect). Therefore, additional analyses by sound condition were not conducted.¹¹

Baseline performance was also included in the original model to account for the participant difference between different testing days and was shown to have a significant main effect on experimental performance, $F(1, 30) = 13.25, p < .001$.

Figure 2. A scatter plot depicting the distribution of test accuracy scores (y-axis) by anxiety difference (y-axis). As the difference between baseline and post-test anxiety decreased or grew, there was not a significant impact on task performance (participants were not able to get larger than 100% (1) test accuracy), suggesting that although anxiety may not be driving performance, it may impact something else such as attention.

¹¹ For further exploration of anxiety differences by sound condition, view appendix F

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However, when interacted with baseline test performance, anxiety difference did begin to approach significance, $F(1, 30) = 3.64, p = .066$. The interaction between anxiety difference and sound condition also began to approach significance, $F(3, 29) = 2.41, p = .087$.

Connectedness to Music, Anxiety, and Performance

Connectedness to music was also explored as a mitigating factor in experimental performance/accuracy (added to the original model which looked at performance/accuracy as a dependent variable of the interaction between baseline task performance/accuracy, sound condition/soundscape, and anxiety difference). However, there was not a significant main effect of connectedness to music on experimental performance $F(1, 30) = 2.29, p = .183$. There were also no significant interactions between anxiety difference, sound condition/soundscape, or baseline performance/accuracy. However, connectedness to music scores were examined exploratorily and descriptively in conjunction with anxiety difference and experimental performance/accuracy across sound conditions/soundscapes (see figures 3 and 4).

Figure 3. A scatter plot exploring connectedness to music score (as a percentage; on the x-axis) in comparison to difference in anxiety across sound conditions/soundscapes (represented on the y-axis).

Figure 4. A scatter plot exploring connectedness to music score (as a percentage; on the y-axis) in comparison to experimental task performance/accuracy (also as a percentage; on the x-axis) across sound conditions/soundscapes.

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Discussion

As the amount of testing that students are subjected to grows, it is important to consider not only how this increased testing impacts student learning, but also how the environment surrounding this phenomenon impacts student testing behaviors in terms of the production of student (testing) anxiety and the ability of students to perform well/to the best of their abilities. In this study, test performance (at time two) was greatly impacted by the inclusion of various sound conditions, and scores were specifically improved in the preferred sound condition. This finding suggests that the environment has a significant ability to manipulate test performance, which is especially important when it comes to examining how to improve testing behaviors in an easier and more cost-efficient way. However, because testing is a complicated phenomenon and the model demonstrated significant interactions between all variables assessed (baseline performance, anxiety difference, and sound condition; suggesting they all build on each other in terms of impacting performance), it may be more difficult to discern exactly how performance was being impacted by these sounds. In general understanding- all of these things would impact performance, anxiety may prevent focus, baseline performance may be predictive of later performance to the student (for better or for worse), and sound condition may impact a person's mood or speed of completion; it is a bit more difficult to discern exactly how these variables individually impact performance. The following sections will attempt to bridge that gap in understanding by suggesting possible reasonings as to how testing was impacted by these variables.

Sound Conditions and Performance

Regarding the first research question:

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“If music preference has been shown to impact a person’s mood, and through the arousal-mood hypothesis we know that mood impacts cognitive performance, to what extent can music (when it is self-selected to a person’s likes or dislikes) be used to impact and possibly improve cognitive performance in an in-class/testing environment?”

The first hypothesis that the various soundscapes will have some impact on cognitive student performance was supported. The sound conditions did have a main impact on student accuracy in the experimental condition and was shown to have mitigating properties when interacted with both baseline test performance/accuracy and anxiety difference scores. Because there was also a main effect of baseline performance on experimental test accuracy (time 2 testing), but not a main effect of anxiety difference, the interaction between the three variables may suggest that although anxiety contributed to the model, it may not be the biggest factor in understanding student performance accuracy.

When looked at directionally, in terms of the third hypothesis which stated that the preferred music condition would yield better cognitive performance than the other sound conditions, the hypothesis was supported when preferred music was compared to non-preferred and ambient sound conditions but was not supported (as strongly) when compared to the silence baseline. When compared to the non-preferred music condition, participants on average performed approximately 22% better in the preferred music condition. When compared to the ambient sound condition, participants on average performed approximately 20% better. Although there was not a significant difference between preferred music and silence sound conditions in a two-tailed test, when assessed

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directionally on a one tailed test to determine if performance was better in a preferred music condition, significance was reached ($p=.05$) and participants on average performed approximately 9% better in the preferred sound condition. This smaller finding may be attributed to the lack of background noise or music that impact attention, this may suggest the threshold to which students can pay attention without additional stimuli to focus on. Although this difference in performance between preferred and silence conditions appears to not be as strong, participant performance on average did seem to significantly and strongly improve in the preferred sound conditions as compared to all other sound conditions/soundscapes. This finding suggests that the utilization of sound can be a strong and important factor in influencing test performance, but what are some potential explanations for why this is?

There are many reasons that test performance may be hindered, and anxiety may not be the biggest predictor of diminished task performance. Although high levels of anxiety have been linked to diminished performance in the literature (Deffenbacher, 1978) and aspects of performance anxiety include diminished focus, concentration, and attention, anxiety may not be what is mitigating the changes in these behaviors.¹² In other words, these factors could be changing on their own without an affective component change mitigating the shift. In fact, increased student testing may lead to less student interest in performing to succeed and more focus on not failing because increased testing lessens the ability for students to prepare fully. This increased testing and focus not to fail may be linked to greater issues with focus in terms of performance. Students may not be

¹² Anxiety also has a complex relationship with performance where too much or too little anxiety may adversely impact performance (there may be too much or not enough pressure on students to perform) (Arent & Landers, 2003). However, because many facets of performance also impact how much anxiety a person has, it is difficult to discern exactly where anxiety comes into play in these testing situations.

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able to concentrate on the task at hand because they are so focused on not performing poorly. This focus on not failing has actually been shown to diminish task performance (Atkinson & Litwin, 1960). However, if the focus is placed outside of failure or if there is another more pressing environmental or psychologically distracting variable to pay attention to such as sound, performance may improve. In conjunction with the concept of the ability of music to drive affect production (sad music makes people sadder and vice versa), mood-congruency in music selection (you want to listen to happy things if you're happy), and the arousal-mood hypothesis in which affective state impacts cognitive performance, this line of reasoning is a potential explanation as to why people performed better in preferred sound condition than the other sound conditions.

Alternatively, in response to the second research question,¹³ when thought about in terms of the availability of neural resources, because there was a strong impact of sound condition on test performance accuracy and music/sound has been shown to be connected to speed of performance, it is not a far leap to consider that the presence of music and people's ability to entrain to it allowed them to complete the task more accurately. Music is a passive stimulus in which people do not put a lot of cognitive effort into recognizing specifically unless they are trained to do so (Bidelman & Walker, 2017). However, this passive collection of information in the form of music may serve as a guide for temporal performance and this use of rhythm has been shown to increase memory recall (Jellison, 1976). So, in the case of the reading comprehension tasks in this study, the use of music and the consistent rhythmic properties may have allowed the

¹³ Does sound still have an impact on behavior and performance when it is not actively attended to or at least, not the same focus?

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participants to not only complete the tasks faster, but also served as a means to focus and recall the information read for increased test accuracy.¹⁴ This may also be because focus and performance were driven by a factor other than the student's own cognitive ability and they didn't need to attend to their own speed of performance because it was being obtained auditorily and thus had more mental energy to perform in the tasks more accurately.

Anxiety and Performance

Regarding the third research question: "To what extent does one's soundscape impact affect management in classroom settings and how do these expressions impact performance?" The second and fourth hypotheses regarded the impact of anxiety on task performance and were not significantly supported statistically by the data. However, this study may not have replicated the stress produced by high-stakes standardized testing situations that are shown to elicit more anxiety (Segool et al., 2013). Across sound conditions anxiety differences were not significantly impacted by the inclusion of sound (anxiety difference scores were really across the board in all sound conditions). However, this data was also examined descriptively in a post-hoc manner to examine any possible suggestions of the impact of anxiety on performance on a student-by-student level. When anxiety increased between the pre-test and post-test, there was a wider distribution of scores. Suggesting that when anxiety increased participants seemed more likely to perform worse than when anxiety decreased between the first and second assessment (see figure 2 for a graphical representation of this finding).

¹⁴ Rhythm may have been linked to the participants own bodily rhythms, so speed of reading, breathing, etc. may have been driven by the music as well.

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When looked at descriptively by sound condition, the impact of anxiety on task performance seemed to be a little bit more convincing than the original statistical output (see figures F1-F4 in appendix F). The introduction of preferred music seemed to decrease anxiety on average and larger differences in anxiety in this condition seemed to suggest improved performance. This makes sense as emotional state has been linked to attention (Derryberry & Rothbart, 1988), and attention is something that can be influenced by anxiety, with lower anxiety potentially allowing someone to pay more attention. Non-preferred music seemed to yield either no change or an increase in anxiety scores. However, test performance in this condition appeared to be on average lower regardless of anxiety difference, suggesting anxiety may not have been a mediator of performance in this condition. Participant anxiety, whether that be an increase or decrease seemed to have a fairly equal distribution across both ambient and silence sound conditions (it seemed to weakly suggest increased anxiety in the ambient sound condition; anxiety in this condition seemed more likely to either stay the same or increase). Participants appeared to be less anxious or more likely to decrease their anxiety with the inclusion of preferred music (partially supporting the fourth hypothesis that preferred music would decrease anxiety and increase performance). However, because of the small sample size, there is not enough power to actually support any of these suggestions. Additionally, it may be beneficial to have a more sensitive anxiety measure in which participants physiological symptoms of anxiety such as galvanic skin response (Chattopadhyay, Bond, & Lader, 1975) or heartrate (Dobkin & Pihl, 1992) are measured to potentially get a more honest reading of how participant anxiety impacted testing.

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Although anxiety did not yield a significant main effect, there were some interesting findings in terms of experimental test accuracy with the significant interactions between sound condition and baseline performance. Anxiety is a complex and multifaceted phenomenon, so although there was not a main effect, anxiety may be influencing performance in some other interesting and more nuanced way. For example, when the impact of baseline performance and sound condition on experimental performance were held constant, if anxiety was increasing over testing sessions, participants were more likely to perform better in the ambient sound condition and worse in the silence condition. Ambient sound may have increased performance because it is like the anxiety produced in the actual testing environment (see figure G1 in appendix G). Hearing people moving and talking can often be distracting, and in a testing situation, anxiety inducing because it may put more stress on the student to feel like they must complete their work faster. If the student's anxiety increased and performed better in the ambient sound condition which was meant to elicit more anxiety, the student may have performed better because their situation was mood-congruent (DeMarco, Taylor, & Friedman, 2015) and potentially more familiar. It may have been easier to perform because they already had the expectation that other people would disrupt their performance and therefore found it easier to focus regardless of whether their anxiety was increased or decreased across conditions (Bell et al., 2017). However, if the participant came in with high anxiety they were more likely to perform worse in the ambient sound condition and better in the silence condition (see figure G2 in appendix G).

Preferred and non-preferred sound condition anxiety differences did not seem to be strongly impacted when these other variables were held constant suggesting that

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anxiety may not have been a strong factor in determining performance in these sound conditions, but it is also possible that different aspects of the student's well-being and interaction with the testing environment can impact different parts of testing at different times. It is unlikely that only one facet of a person's behavior or aspect of their personality would impact something as complicated as testing that requires so many moving parts to perform well. In testing, things such as short-term memory, working memory, inhibition, and affect regulation must all be functioning together for a person to perform (Ihle et al., 2015). So, although it is possible for one of these facets such as sound condition or anxiety alone to impact test performance (and this is somewhat reflected in the data such as ambient sound and anxiety), it is probably more likely that it is a combination of all these items that really impact task performance.

Connectedness to Music and Performance

Connectedness to music (as assessed by the MEQ) was explored post-hoc as another factor added to the main model because a person's connectedness has been shown to be dramatically linked to mood regulation, physiological arousal, and self-awareness (Schafer, 2016), but was shown to not have a statistically significant impact on test performance (in time two). However, speculatively, there were some more interesting trends to observe by looking at the descriptive data in the anxiety and performance conditions (see figures 3 and 4 for graphic representations of the data) that may have been supported had there been a larger sample to run this model on (may not have had enough statistical power in this limited sample size-not enough data in the model to fully support this). Anxiety difference scores seemed to be equally dispersed across connectedness to music. However, as connectedness to music increased, there seemed to be a wider

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dispersal of anxiety difference scores with the majority of people reporting either no change or a decrease in anxiety. So, people with a higher connectedness to music may also be more likely to experience a decrease in anxiety. This idea may amplify the effects of the sound conditions seen in the anxiety difference assessments, meaning that the more connected to music someone is in accordance with the preferred music condition, their anxiety may be significantly decreased. In fact, as mitigated by connectedness to music, preferred music anxiety differences did seem to decrease from time one to time two and non-preferred music anxiety differences seemed to either stay the same or increase from time one to time two. This trend, although it is very weak, seems to suggest that anxiety regulation (in the music conditions at least) may be further mitigated by how connected to music a person is. However, more sensitive measures of anxiety and a larger participant pool is needed to determine if connectedness to music truly is a mitigating variable for anxiety.

When task performance and connectedness to music was viewed descriptively, the preferred condition seemed to increase performance to a certain extent. In the non-preferred condition, participants seemed to perform consistently worse, but this was even more extreme as participants were more connected to music. The lower performance in non-preferred music conditions as people were more connected to music may be explained by a greater attachment or amount of attention paid to the soundscape. As people heard a stimulus that was particularly displeasing, they may have spent more time acknowledging it which may have made concentration and task performance worse. However, when viewed in conjunction with the trends suggested from the anxiety section, it could also be a combination of higher connectedness to music producing more

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anxiety, which in turn produces worse task performance. As stated before, task performance is really very multifaceted, so it is unrealistic to place determinism on one facet as being the “cause” for lessened test performance. Test performance/accuracy in the ambient sound condition seemed to stay relatively consistent across connectedness to music which makes sense because it does not necessarily fit into the traditional definition of music that the MEQ addressed. Because it does not fit into the traditional definition of music, it may be useful to modify the scale to look at a person’s connection to their auditory environment rather than the very narrow definition of music that the MEQ addresses as connectedness or attunement to sound may tell us more about how these sounds have the potential to impact a person’s cognitive environment.¹⁵ Silence appeared to improve performance as connectedness to music increased and this is probably a result of the lack of cognitive distraction (i.e. people not having something they either wanted or did not want to listen to/pay attention to). Although connectedness to music may not serve as an independent variable that impacts test performance on its own, it does appear like it may impact and interact with some of the more prominent variables in the original model. If there was a larger sample size, there may be evidence to support connectedness to music serving as an amplifier to some of the other variables that were shown to impact test performance.

Strengths and Limitations

As common with all research, this study was not without its limitations. A primary limitation to this study was the small sample size which could be attributed to the

¹⁵ This finding may also give more support to the idea of the probability of rhythmic entrainment and memory recall discussed in the sound and performance section.

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institution where data collection took place. Being a small liberal arts college with limited resources, very few students are interested in attending let alone maintaining continuous participation in research studies. The four week nature of this study may also have inhibited increased participant size as students may not have had time in their schedule to commit to a 30 minute testing session once a week for four weeks. In addition to this small sample size, the age of this sample size could also be a limitation as these students are older than the range of students that are subjected to the most standardized testing, which means that this data may not be an accurate representation of how test anxiety and sound condition may impact performance because younger students may present different levels of anxiety or different connections to music.

In response to the actual materials used, as mentioned previously, the anxiety measure utilized may not have been sensitive enough as an eight item, self-report measure to truly assess participant anxiety and a more sensitive measure that takes into account more physiological symptoms of anxiety such as sweating or heartrate may give more honest and accurate results. Additionally, although the SAT reading tasks used have been shown to have predictive reliability and validity, the length of tasks across testing weeks (in terms of congruence-they were not all exactly the same in length) may have altered performance. However, because the SAT has been shown to have predictive validity on future performance and I limited my selection of the tasks to selections that were of a similar length and fictional, some of these issues may have been combatted.

Despite sample size and the sensitivity of my anxiety measure, very robust findings emerged in terms of examining the impact of sound on test performance. These findings, in part, can be attributed to the design of this experiment (strengths). For

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instance, the inclusion of a baseline score each week to compare to the manipulation in the experimental condition was a way to account for the variability of the participant's anxiety and performance from week to week. Additionally, the four week nature of the study should have produced a learning effect in which participants did better in the later weeks of testing. However, as the order of the sound conditions moved from baseline to preferred to non-preferred to ambient, participants still performed worse in the non-preferred and ambient sound conditions which they should have performed better in if there was a learning effect, which only makes the significant findings more compelling.

Future Research?

Although this study provides compelling support for the idea that test performance can be mitigated by sound condition and anxiety, there is a lot more research that can be done on testing, testing behaviors, and methods to impact testing on a larger scale. As a largely understudied field, ways to mitigate test anxiety (or other behaviors that impact test performance) within a classroom setting and outside of individual preventative measures may be a compelling avenue for future research. If there were a way to improve task performance on a larger, less personal scale it could be hugely beneficial to the American education system in terms of producing students that they deemed to be more globally qualified for comparison. Additionally, it may be more representative of the actual student knowledge base as it would eliminate some of the behavioral inhibitors of task performance.

Alternatively, because anxiety was not shown to have a significant main effect in this model of test performance, it may be helpful to do more research into what aspects of anxiety most effect test performance or how test anxiety can be elicited in individuals. If

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we can understand how test anxiety is produced (aside from extreme pressure put on students to perform), it may be a better platform to explore treatments off of. Because anxiety and affect regulation can be linked to music conditions, another large focus of this research that was not really tended to in this study was the attention or attunement to non-consciously attended objects such as sound. It would be interesting to explore what kinds of sounds people pay attention to. Do different types of sounds require different amounts of attention/resource allocation? It may also be interesting to look more at the individual qualities of different music to determine if there are certain types or genres that yield better test performance as a whole (aside from the Mozart Effect and designer music¹⁶).

Conclusion

The results of these testing situations are used to, not only compare and determine student outcomes on a personal, local, and global level (achievement outcomes relating to the student themselves, from student to student, and from student to adults), but also to examine student knowledge retention. As testing has become the foundation of the educational system, it is becoming increasingly more important to understand how the testing environment works, and what can be done to the environment to improve student performance. There is a tremendous amount of pressure on students to perform well and less attention is being paid to the behavioral problems that are being produced as a result of this increased pressure and frequency of testing. Therefore, making the study of phenomena such as test anxiety even more important. Test anxiety has been shown to affect, not only emotional regulation, task focus and completion, but also performance.

¹⁶ Designer music was apparently shown to be able to produce a more conscious emotional change (McCraty et al., 1998).

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Although test anxiety is an increasingly widespread problem that many students face, it has traditionally been treated on an individual level and as a preventative behavioral modification, to be implemented outside of the classroom. This study aimed to explore the more immediate and larger spread impact of within classroom environment manipulations to impact student performance and test anxiety on a classroom/multiple student level. The study found that listening to preferred music can actually be used to improve test performance. Although no statistically significant conclusions could be drawn from the anxiety measure, there was a significant finding in the interaction of the three main variables of baseline performance, anxiety difference, and sound condition suggesting that although anxiety was not a main facet in this model, it still may have been impacting student performance.

As high performance seems to be a goal in the American Education system as it compares itself to education systems globally, it stands to reason that research needs to be conducted to increase our students performance. The simple question that educators need to ask is, “what do we have control of and what do we not have control of?” In a testing situation, teachers do have some control on the environment in which testing occurs. Knowing that sound condition and baseline performance were significant predictors of test performance, and the suggestion that anxiety can be mitigated by soundscapes should motivate educators to explore how they might use these findings to decrease anxiety and increase test performance. Perhaps the most important findings of this study was the understanding of the importance of utilizing sound to manipulate performance. Soundscapes are a vastly understudied field, but an interesting and potentially very impactful method to explore underlying causes of behavior and attention (as it is a

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passive stimulus that can be attended to without conscious attention). Although this study provides a baseline introduction to how music/sounds affects anxiety and impact behavior as studied through the narrow, but important, lens of test performance, this is hopefully only the beginning to further explorations on how soundscapes can impact anxiety, behavior and perhaps other emotional issues.

To manipulate performance, which is a vastly understudied field in terms of exploring from a point of personal preference, is an interesting and potentially very impactful method to explore more underlying causes of behavior and focus (as it is a passive stimulus that can be attended to without conscious attention). Although this study provides a baseline introduction to how music/sounds and anxiety may impact behavior through the narrow but important lens of test performance, this is hopefully only the beginning to further explorations on how soundscapes can impact behavior.

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Appendix A

The Revised Short Test of Musical Preferences (STOMP)

Interested Thesis Participant

Participants will be asked to complete a reading comprehension task once a week for 4 weeks.
Participants will be compensated with a \$5 giftcard for each completed session.

1. Are you over the age of 18?

Mark only one oval.

☐ Yes

☐ No

2. What is your name and preferred pronouns?

3. What is your email?

4. Will you be able to commit to one 20 minute session once a week for four weeks?

Mark only one oval.

☐ Yes

☐ No

☐ Maybe

5. Of the following list, please select which genre is your MOST preferred genre.

Mark only one oval.

☐ Alternative

☐ Bluegrass

☐ Blues

☐ Classical

☐ Country

☐ Dance/Electronica

☐ Folk

☐ Funk

☐ Gospel

☐ Heavy Metal

☐ International/Foreign

☐ Jazz

☐ New Age

☐ Oldies

☐ Opera

☐ Pop

☐ Punk

☐ Rap/Hip-hop

☐ Reggae

☐ Religious

☐ Rock

☐ Soul/R&B

☐ Soundtracks/theme songs

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6. Of the following list, please select which genre is your LEAST preferred genre.

Mark only one oval.

- ☐ Alternative
- ☐ Bluegrass
- ☐ Blues
- ☐ Classical
- ☐ Country
- ☐ Dance/Electronica
- ☐ Folk
- ☐ Funk
- ☐ Gospel
- ☐ Heavy Metal
- ☐ International/Foreign
- ☐ Jazz
- ☐ New Age
- ☐ Oldies
- ☐ Opera
- ☐ Pop
- ☐ Punk
- ☐ Rap/Hip-hop
- ☐ Reggae
- ☐ Religious
- ☐ Rock
- ☐ Soul/R&B
- ☐ Soundtracks/theme songs

Thank you!

I will be contacting you shortly to arrange dates and times for your participation! If you have any questions, comments or concerns please do not hesitate to contact me at phoebe.sartoriams14@ncf.edu or 772-204-4679

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Appendix B

Operationalized Music Genre Definitions

7 most preferred genres:

Rock- characterized by a strong beat, electric guitars/drums, and a catchy melody backed by 3 or 4 chords. (used “Rock music instrumental mix 10 hours”)

Alternative-characterized as a subgenre of rock music with similar characteristics, but slightly more mellow and melodic with lighter drums; existing outside of the mainstream rock. (used “Alternative rock music mix 10 hours”)

Classical- characterized as serious or conventional music (art music) produced in the western music tradition from 1750-1830; usually characterized by orchestral arrangements. (used “Tchaikovsky-1812 overture 10 hours”)

Oldies- characterized as a catch all term to describe western music released in the 50s and 60s, usually characterized by pop-like melodies and early 50s rock which is more rhythmic/dancable in nature. (used “Hits of the 50’s & 60’s instrumental 1”)

Pop- characterized by the current cultural climate (very loosely defined), typically short, fast moving, light-hearted, and catchy melodies that are deemed “danceable” and energetic. (used “Pop rock instrumental music compilation-cheerful and upbeat songs for working and studying 2016”)

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International- term used to characterize non-western music; characterized by any non-western music local to a specific region and typically more folk-like/ethnic in nature.

(used “Scandinavian folk, nordic music 10 hours”)

Soul/R&B- originated at the demise of disco in 1980; characterized by drum-machine backed rhythms with a slightly jazzy feel with a more relaxed swaying tempo. (used RnB music instrumental 10 hours)

7 least preferred genres:

Blues-based on a pentatonic scale and and 12 bar chord progression, often more somber in nature evoking similar moods such as spirituals. (used “Blues music instrumental 10 hours”)

Country- developed in the southern United States (rooted in folk, spirituals, and blues), often shares many characteristics with classic rock in which there is a guitar heavy melody backed by a simpler, usually 4 chord progression. (used “Country music instrumental 10 hours”)

Religious- in the western art tradition, this form of music is usually specific to religious practice, as Christianity appears to be one of the largest practiced religions in the United States, Christian music was used in place of religious music. Christian music is typically classified as being accompanied by organ, piano, electronic keyboard, or guitar and is typically more melodic and lighthearted in nature. Instrumentation is usually lighter and

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simpler to account for audience participation (singing). (used “Hymns instrumental- various artists”)

Heavy Metal-characterized by aggressive, driving rhythms and amplified/distorted guitars, usually elicits a high energy emotional reaction (can be positively or negatively valenced). (used “Heavy metal music instrumental 10 hours”).

Bluegrass- usually reminiscent of folk music (and often placed in the same category), a form of American roots music. Characterized by turn taking in which various instruments play a melody over background chords (i.e. breakdowns), usually played on acoustic string instruments featuring banjos and dobros (resonator guitar). (used “Bluegrass instrumentals [1962]- The Osborne Brothers”)

Punk- rooted in garage rock, which is characterized by hard-edged melodies and stripped down instrumentation. Similar in style to alternative rock music just a little harder and grungier in nature. (used “Punk rock music instrumental 10 hours”)

Opera- usually characterized by the context in which it is played (like for a show by a pit orchestra), similar in nature to classical music just a little less complex melodically to allow space for singers. Usually grander in nature and meant to provoke emotions from audience. (used “1 hour instrumental opera music- for relaxation and focus”)

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Appendix C

SAT Reading Comprehension Tasks

Week 1

Task 1

This passage is adapted from Virginia Woolf, *Three Guineas*. ©1938 by Harcourt, Inc. Here, Woolf considers the situation of women in English society.

Line
5 Close at hand is a bridge over the River Thames, an admirable vantage ground for us to make a survey. The river flows beneath; barges pass, laden with timber, bursting with corn; there on one side are the domes and spires of the city; on the other, Westminster and the Houses of Parliament. It is a place to stand on by the hour, dreaming. But not now. Now we are pressed for time. Now we are here to consider facts; now we must fix our eyes upon the procession—the procession of the sons of educated men.

20 There they go, our brothers who have been educated at public schools and universities, mounting those steps, passing in and out of those doors, ascending those pulpits, preaching, teaching, administering justice, practising medicine, transacting business, making money. It is a solemn sight always—a procession, like a caravanserai crossing a desert. . . . But now, for the past twenty years or so, it is no longer a sight merely, a photograph, or fresco scrawled upon the walls of time, at which we can look with merely an esthetic appreciation. For there, trapesing along at the tail end of the procession, we go ourselves. And that makes a difference. We who have looked so long at the pageant in books, or from a curtained window watched educated men leaving the house at about nine-thirty to go to an office, returning to the house at about six-thirty from an office, need look passively no longer. We too can leave the house, can mount those steps, pass in and out of those doors, . . . make money, administer justice. . . . We who now agitate these humble pens may in another century or two speak from a pulpit. Nobody will dare contradict us then; we shall be the mouthpieces of the divine spirit—a solemn thought, is it not? Who can say whether, as time goes on, we may not dress in military uniform, with gold lace on our breasts, swords at our sides, and something like the old family coal-scuttle on our heads, save that that venerable object was never decorated with plumes of white horsehair. You laugh—indeed the shadow of the private house still makes those dresses look a little queer. We have worn private clothes so long. . . . But we have not come here to laugh, or to

talk of fashions—men's and women's. We are here, on the bridge, to ask ourselves certain questions. And they are very important questions; and we have very little time in which to answer them. The questions that we have to ask and to answer about that procession during this moment of transition are so important that they may well change the lives of all men and women for ever. For we have to ask ourselves, here and now, do we wish to join that procession, or don't we? On what terms shall we join that procession? Above all, where is it leading us, the procession of educated men? The moment is short; it may last five years; ten years, or perhaps only a matter of a few months longer. . . . But, you will object, you have no time to think; you have your battles to fight, your rent to pay, your bazaars to organize. That excuse shall not serve you, Madam. As you know from your own experience, and there are facts that prove it, the daughters of educated men have always done their thinking from hand to mouth; not under green lamps at study tables in the cloisters of secluded colleges. They have thought while they stirred the pot, while they rocked the cradle. It was thus that they won us the right to our brand-new sixpence. It falls to us now to go on thinking; how are we to spend that sixpence? Think we must. Let us think in offices; in omnibuses; while we are standing in the crowd watching Coronations and Lord Mayor's Shows; let us think . . . in the gallery of the House of Commons; in the Law Courts; let us think at baptisms and marriages and funerals. Let us never cease from thinking—what is this "civilization" in which we find ourselves? What are these ceremonies and why should we take part in them? What are these professions and why should we make money out of them? Where in short is it leading us, the procession of the sons of educated men?

1. The main purpose of the passage is to
 - A) emphasize the value of a tradition.
 - B) stress the urgency of an issue.
 - C) highlight the severity of social divisions.

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- D) question the feasibility of an undertaking
2. The central claim of the passage is that
- A) educated women face a decision about how to engage with existing institutions.
 - B) women can have positions of influence in English society only if they give up some of their traditional roles.
 - C) the male monopoly on power in English society has had grave and continuing effects.
 - D) the entry of educated women into positions of power traditionally held by men will transform those positions.
3. Woolf uses the word “we” throughout the passage mainly to
- A) reflect the growing friendliness among a group of people.
 - B) advance the need for candor among a group of people.
 - C) establish a sense of solidarity among a group of people.
 - D) reinforce the need for respect among a group of people.
4. According to the passage, Woolf chooses the setting of the bridge because it
- A) is conducive to a mood of fanciful reflection.
 - B) provides a good view of the procession of the sons of educated men.
 - C) is within sight of historic episodes to which she alludes.
 - D) is symbolic of the legacy of past and present sons of educated men.
5. Woolf indicates that the procession she describes in the passage
- A) has come to have more practical influence in recent years.
 - B) has become a celebrated feature of English public life.
 - C) includes all of the richest and most powerful men in England.
 - D) has become less exclusionary in its membership in recent years.

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6. Which choice provides the best evidence for the answer to the previous question?
 - A) Lines 12-17 (“There... money”)
 - B) Lines 17-19 (“It... desert”)
 - C) Lines 23-24 (“For... ourselves”)
 - D) Lines 30-34 (“We... pulpit”)
7. Woolf characterizes the questions in lines 53-57 (“For we... men”) as both
 - A) controversial and threatening.
 - B) weighty and unanswerable.
 - C) momentous and pressing.
 - D) provocative and mysterious
8. Which choice provides the best evidence for the answer to the previous question?
 - A) Lines 46-47 (“We... questions”)
 - B) Lines 48-49 (“And... them”)
 - C) Line 57 (“The moment... short”)
 - D) Line 62 (“That... Madam”)
9. Which choice most closely captures the meaning of the figurative “sixpence” referred to in lines 70 and 71?
 - A) Tolerance
 - B) Knowledge
 - C) Opportunity
 - D) Perspective

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10. The range of places and occasions listed in lines 72-76 ("Let us... funerals") mainly serves to emphasize how
- A) novel the challenge faced by women is.
 - B) pervasive the need for critical reflection is.
 - C) complex the political and social issues of the day are.
 - D) enjoyable the career possibilities for women are.

Task 2

Akira was waiting in the entry. He was in his early twenties, slim and serious, wearing the black military-style uniform of a student. As he bowed—his hands hanging straight down, a black cap in one, a yellow oil-paper umbrella in the other—Chie glanced beyond him. In the glistening surface of the courtyard's rain-drenched paving stones, she saw his reflection like a dark double.

"Madame," said Akira, "forgive my disruption, but I come with a matter of urgency."

His voice was soft, refined. He straightened and stole a deferential peek at her face.

In the dim light his eyes shone with sincerity. Chie felt herself starting to like him.

"Come inside, get out of this nasty night. Surely your business can wait for a moment or two."

"I don't want to trouble you. Normally I would approach you more properly but I've received word of a position. I've an opportunity to go to America, as dentist for Seattle's Japanese community."

"Congratulations," Chie said with amusement.

"That is an opportunity, I'm sure. But how am I involved?"

Even noting Naomi's breathless reaction to the name card, Chie had no idea. Akira's message, delivered like a formal speech, filled her with maternal amusement. You know how children speak so earnestly, so hurriedly, so endearingly about things that have no importance in an adult's mind? That's how she viewed him, as a child.

It was how she viewed Naomi. Even though Naomi was eighteen and training endlessly in the arts needed to make a good marriage, Chie had made no effort to find her a husband.

Akira blushed.

"Depending on your response, I may stay in Japan. I've come to ask for Naomi's hand."

Suddenly Chie felt the dampness of the night.

"Does Naomi know anything of your . . . ambitions?"

"We have an understanding. Please don't judge my candidacy by the unseemliness of this proposal. I ask directly because the use of a go-between takes much time. Either method comes down to the same thing: a matter of parental approval. If you give your consent, I become Naomi's yoshi. We'll live in the House of Fuji. Without your consent, I must go to America, to secure a new home for my bride."

Eager to make his point, he'd been looking her full in the face. Abruptly, his voice turned gentle. "I see I've startled you. My humble apologies. I'll take no more of your evening. My address is on my card. If you don't wish to contact me, I'll reapproach you in two weeks' time. Until then, good night."

He bowed and left. Taking her ease, with effortless grace, like a cat making off with a fish.

"Mother?" Chie heard Naomi's low voice and turned from the door. "He has asked you?"

The sight of Naomi's clear eyes, her dark brows gave Chie strength. Maybe his hopes were preposterous.

"Where did you meet such a fellow? Imagine! He thinks he can marry the Fuji heir and take her to America all in the snap of his fingers!"

Chie waited for Naomi's ripe laughter.

Naomi was silent. She stood a full half minute looking straight into Chie's eyes. Finally, she spoke.

"I met him at my literary meeting."

Naomi turned to go back into the house, then stopped.

"Mother."

"Yes?"

"I mean to have him."

* a man who marries a woman of higher status and takes her family's name

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1. Which choice best describes what happens in the passage?
 - A) One character argues with another character who intrudes on her home.
 - B) One character receives a surprising request from another character.
 - C) One character reminisces about choices she has made over the years.
 - D) One character criticizes another character for pursuing an unexpected course of action.
2. Which choice best describes the developmental pattern of the passage?
 - A) A careful analysis of a traditional practice
 - B) A detailed depiction of a meaningful encounter
 - C) A definitive response to a series of questions
 - D) A cheerful recounting of an amusing anecdote
3. As used in line 1 and line 65, “directly” most nearly means
 - A) frankly.
 - B) confidently.
 - C) without mediation.
 - D) with precision.
4. Which reaction does Akira most fear from Chie?
 - A) She will consider his proposal inappropriate.
 - B) She will mistake his earnestness for immaturity.
 - C) She will consider his unscheduled visit an imposition.
 - D) She will underestimate the sincerity of his emotions.
5. Which choice provides the best evidence for the answer to the previous question?
 - A) Line 33 (“His voice... refined”)
 - B) Lines 49-51 (“You... mind”)
 - C) Lines 63-64 (“Please... proposal”)
 - D) Lines 71-72 (“Eager... face”)
6. In the passage, Akira addresses Chie with
 - A) affection but not genuine love.
 - B) objectivity but not complete impartiality.
 - C) amusement but not mocking disparagement.
 - D) respect but not utter deference.
7. The main purpose of the first paragraph is to
 - A) describe a culture.
 - B) criticize a tradition.
 - C) question a suggestion.
 - D) analyze a reaction.

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8. As used in line 2, “form” most nearly means
 - A) appearance.
 - B) custom.
 - C) structure.
 - D) nature.
9. Why does Akira say his meeting with Chie is “a matter of urgency” (line 32)?
 - A) He fears that his own parents will disapprove of Naomi.
 - B) He worries that Naomi will reject him and marry someone else.
 - C) He has been offered an attractive job in another country.
 - D) He knows that Chie is unaware of his feelings for Naomi.
10. Which choice provides the best evidence for the answer to the previous question?
 - A) Line 39 (“I don’t... you”)
 - B) Lines 39-42 (“Normally... community”)
 - C) Lines 58-59 (“Depending... Japan”)
 - D) Lines 72-73 (“I see... you”)

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Week 2

Task 1

Questions 1-10 are based on the following passage.

This passage is adapted from Daniyal Mueenuddin, "Nawabdin Electrician." ©2009 by Daniyal Mueenuddin.

Another man might have thrown up his hands—but not Nawabdin. His twelve daughters acted as a spur to his genius, and he looked with
Line 5 satisfaction in the mirror each morning at the face of a warrior going out to do battle. Nawab of course knew that he must proliferate his sources of revenue—the salary he received from K. K. Harouni for tending the tube wells would not even begin to suffice. He set up a little one-room flour mill, run off
10 a condemned electric motor—condemned by him. He tried his hand at fish-farming in a little pond at the edge of his master's fields. He bought broken radios, fixed them, and resold them. He did not demur even when asked to fix watches, though that
15 enterprise did spectacularly badly, and in fact earned him more kicks than kudos, for no watch he took apart ever kept time again.

K. K. Harouni rarely went to his farms, but lived mostly in Lahore. Whenever the old man visited,
20 Nawab would place himself night and day at the door leading from the servants' sitting area into the walled grove of ancient banyan trees where the old farmhouse stood. Grizzled, his peculiar aviator

glasses bent and smudged, Nawab tended the
25 household machinery, the air conditioners, water heaters, refrigerators, and water pumps, like an engineer tending the boilers on a foundering steamer in an Atlantic gale. By his superhuman efforts he almost managed to maintain K. K. Harouni in the
30 same mechanical cocoon, cooled and bathed and lighted and fed, that the landowner enjoyed in Lahore.

Harouni of course became familiar with this ubiquitous man, who not only accompanied him on
35 his tours of inspection, but morning and night could be found standing on the master bed rewiring the light fixture or in the bathroom poking at the water heater. Finally, one evening at teatime, gauging the psychological moment, Nawab asked if he might say
40 a word. The landowner, who was cheerfully filing his nails in front of a crackling rosewood fire, told him to go ahead.

"Sir, as you know, your lands stretch from here to the Indus, and on these lands are fully seventeen tube
45 wells, and to tend these seventeen tube wells there is but one man, me, your servant. In your service I have earned these gray hairs"—here he bowed his head to show the gray—"and now I cannot fulfill my duties as I should. Enough, sir, enough. I beg you, forgive
50 me my weakness. Better a darkened house and proud hunger within than disgrace in the light of day. Release me, I ask you, I beg you."

The old man, well accustomed to these sorts of speeches, though not usually this florid, filed away at
55 his nails and waited for the breeze to stop.

"What's the matter, Nawabdin?"

"Matter, sir? O what could be the matter in your service. I've eaten your salt for all my years. But sir,
on the bicycle now, with my old legs, and with the
60 many injuries I've received when heavy machinery fell on me—I cannot any longer bicycle about like a bridegroom from farm to farm, as I could when I first had the good fortune to enter your employment. I beg you, sir, let me go."

65 "And what's the solution?" asked Harouni, seeing that they had come to the crux. He didn't particularly care one way or the other, except that it touched on his comfort—a matter of great interest to him.

"Well, sir, if I had a motorcycle, then I could
70 somehow limp along, at least until I train up some younger man."

The crops that year had been good, Harouni felt expansive in front of the fire, and so, much to the disgust of the farm managers, Nawab received a
75 brand-new motorcycle, a Honda 70. He even managed to extract an allowance for gasoline.

The motorcycle increased his status, gave him weight, so that people began calling him "Uncle," and asking his opinion on world affairs, about which he
80 knew absolutely nothing. He could now range further, doing a much wider business. Best of all, now he could spend every night with his wife, who had begged to live not on the farm but near her family in Firoza, where also they could educate at
85 least the two eldest daughters. A long straight road ran from the canal headworks near Firoza all the way to the Indus, through the heart of the K. K. Harouni lands. Nawab would fly down this road on his new machine, with bags and cloths hanging from every
90 knob and brace, so that the bike, when he hit a bump, seemed to be flapping numerous small vestigial wings; and with his grinning face, as he rolled up to whichever tube well needed servicing, with his ears almost blown off, he shone with the speed of his
95 arrival.

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1. The main purpose of the first paragraph is to
 - A) characterize Nawab as a loving father.
 - B) outline the schedule of a typical day in Nawab's life.
 - C) describe Nawab's various moneymaking ventures.
 - D) contrast Nawab's and Harouni's lifestyles.
2. As used in line 16, "kicks" most nearly means
 - A) thrills.
 - B) complaints.
 - C) jolts.
 - D) interests.
3. The author uses the image of an engineer at sea (lines 23-28) most likely to
 - A) suggest that Nawab often dreams of having a more exciting profession.
 - B) highlight the fact that Nawab's primary job is to tend to Harouni's tube wells.
 - C) reinforce the idea that Nawab has had many different occupations in his life.
 - D) emphasize how demanding Nawab's work for Harouni is.
4. Which choice best supports the claim that Nawab performs his duties for Harouni well?
 - A) Lines 28-32 ("By his... Lahore")
 - B) Lines 40-42 ("The landowner... ahead")
 - C) Lines 46-49 ("In your... should")
 - D) Line 58 ("I've... years")

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5. In the context of the conversation between Nawab and Harouni, Nawab's comments in lines 43-52 ("Sir . . . beg you") mainly serve to

- A) flatter Harouni by mentioning how vast his lands are.
- B) boast to Harouni about how competent and reliable Nawab is.
- C) emphasize Nawab's diligence and loyalty to Harouni.
- D) notify Harouni that Nawab intends to quit his job tending the tube wells.

6. Nawab uses the word "bridegroom" (line 62) mainly to emphasize that he's no longer

- A) in love.
- B) naive.
- C) busy.
- D) young.

7. It can reasonably be inferred from the passage that Harouni provides Nawab with a motorcycle mainly because

- A) Harouni appreciates that Nawab has to work hard to support his family.
- B) Harouni sees benefit to himself from giving Nawab a motorcycle.
- C) Nawab's speech is the most eloquent that Harouni has ever heard.
- D) Nawab threatens to quit if Harouni doesn't agree to give him a motorcycle.

8. Which choice provides the best evidence for the answer to the previous question?

- A) Lines 65-66 ("And... crux")
- B) Lines 66-68 ("He didn't... him")
- C) Lines 75-76 ("He even... gasoline")
- D) Lines 80-81 ("He could... business")

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9. The passage states that the farm managers react to Nawab receiving a motorcycle with

A) disgust.

B) happiness.

C) envy.

D) indifference.

10. According to the passage, what does Nawab consider to be the best result of getting the motorcycle?

A) People start calling him “Uncle.”

B) He’s able to expand his business.

C) He’s able to educate his daughters.

D) He can spend more time with his wife.

Task 2

Questions 1-10 are based on the following passage.

This passage is adapted from William Maxwell, *The Folded Leaf*. ©1959 by William Maxwell. Originally published in 1945.

The Alcazar Restaurant was on Sheridan Road near Devon Avenue. It was long and narrow, with tables for two along the walls and tables for four down the middle. The decoration was *art moderne*, except for the series of murals depicting the four seasons, and the sick ferns in the front window. Lymie sat down at the second table from the cash register, and ordered his dinner. The history book, which he propped against the catsup and the glass sugar bowl, had been used by others before him. Blank pages front and back were filled in with maps, drawings, dates, comic cartoons, and organs of the body; also with names and messages no longer clear and never absolutely legible. On nearly every other page there was some marginal notation, either in ink or in very hard pencil. And unless someone had upset a glass of water, the marks on page 177 were from tears.

While Lymie read about the Peace of Paris, signed on the thirtieth of May, 1814, between France and the Allied powers, his right hand managed again and again to bring food up to his mouth. Sometimes he chewed, sometimes he swallowed whole the food that he had no idea he was eating. The Congress of Vienna met, with some allowance for delays, early in November of the same year, and all the powers engaged in the war on either side sent

plenipotentiaries. It was by far the most splendid and important assembly ever convoked to discuss and determine the affairs of Europe. The Emperor of Russia, the King of Prussia, the Kings of Bavaria, Denmark, and Wurttemberg, all were present in person at the court of the Emperor Francis I in the Austrian capital. When Lymie put down his fork and began to count them off, one by one, on the fingers of his left hand, the waitress, whose name was Irma, thought he was through eating and tried to take his plate away. He stopped her. Prince Metternich (his right thumb) presided over the Congress, and Prince Talleyrand (the index finger) represented France.

A party of four, two men and two women, came into the restaurant, all talking at once, and took possession of the center table nearest Lymie. The women had shingled hair and short tight skirts which exposed the underside of their knees when they sat down. One of the women had the face of a young boy but disguised by one trick or another (rouge, lipstick, powder, wet bangs plastered against the high forehead, and a pair of long pendent earrings) to look like a woman of thirty-five, which as a matter of fact she was. The men were older. They laughed more than there seemed any occasion for, while they were deciding between soup and shrimp cocktail, and their laughter was too loud. But it was the women’s voices, the terrible not quite sober pitch of the women’s voices which caused Lymie to skim over two whole pages without knowing what was on them. Fortunately he realized this and went back. Otherwise he might never have known about the

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secret treaty concluded between England, France, and Austria, when the pretensions of Prussia and Russia, acting in concert, seemed to threaten a renewal of the attack. The results of the Congress
65 were stated clearly at the bottom of page 67 and at the top of page 68, but before Lymie got halfway through them, a coat that he recognized as his father's was hung on the hook next to his chair. Lymie closed the book and said, "I didn't think you
70 were coming."

Time is probably no more unkind to sporting characters than it is to other people, but physical decay unsustained by respectability is somehow more noticeable. Mr. Peters' hair was turning gray and his
75 scalp showed through on top. He had lost weight also; he no longer filled out his clothes the way he used to. His color was poor, and the flower had disappeared from his buttonhole. In its place was an American Legion button.

80 Apparently he himself was not aware that there had been any change. He straightened his tie self-consciously and when Irma handed him a menu, he gestured with it so that the two women at the next table would notice the diamond ring on the fourth
85 finger of his right hand. Both of these things, and also the fact that his hands showed signs of the manicurist, one can blame on the young man who had his picture taken with a derby hat on the back of his head, and also sitting with a girl in the curve of
90 the moon. The young man had never for one second deserted Mr. Peters. He was always there, tugging at Mr. Peters' elbow, making him do things that were not becoming in a man of forty-five.

1. Over the course of the passage, the primary focus shifts from
 - A) Lymie's inner thoughts to observations made by the other characters.
 - B) an exchange between strangers to a satisfying personal relationship.
 - C) the physical setting of the scene to the different characters' personality traits.
 - D) Lymie's experience reading a book to descriptions of people in the restaurant.
2. The main purpose of the first paragraph is to
 - A) introduce the passage's main character by showing his nightly habits.
 - B) indicate the date the passage takes place by presenting period details.
 - C) convey the passage's setting by describing a place and an object.
 - D) foreshadow an event that is described in detail later in the passage.
3. It can reasonably be inferred that Irma, the waitress, thinks Lymie is "through eating" (line 37) because
 - A) he has begun reading his book.
 - B) his plate is empty.
 - C) he is no longer holding his fork.
 - D) he has asked her to clear the table.
4. Lymie's primary impression of the "party of four" (line 42) is that they

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- A) are noisy and distracting.
 - B) are a refreshing change from the other customers.
 - C) resemble characters from his history book.
 - D) represent glamour and youth.
5. Which choice provides the best evidence for the answer to the previous question?
- A) Lines 45-47 ("The women... down")
 - B) Lines 47-52 ("One... was")
 - C) Lines 55-59 ("But... them")
 - D) Line 69 ("Lymie... book")
6. The narrator indicates that Lymie finally closes the history book because
- A) his father has joined him at the table.
 - B) the people at the other table are too disruptive.
 - C) he has finished the chapter about the Congress.
 - D) he is preparing to leave the restaurant.
7. The primary impression created by the narrator's description of Mr. Peters in lines 74-79 is that he is
- A) healthy and fit.
 - B) angry and menacing.
 - C) nervous and hesitant.
 - D) aging and shriveled.
8. The main idea of the last paragraph is that Mr. Peters
- A) neglects to spend any time with his family members.
 - B) behaves as if he is a younger version of himself.
 - C) is very conscious of symbols of wealth and power.
 - D) is preoccupied with the knowledge that he is growing old.
9. Which choice best supports the conclusion that Mr. Peters wants to attract attention?
- A) Lines 80-81 ("Apparently... change")
 - B) Lines 81-85 ("He straightened... hand")
 - C) Lines 90-91 ("The young . . . Mr. Peters")
 - D) Lines 91-93 ("He was... forty-five")
10. As used in line 93, "becoming" most nearly means
- A) emerging.
 - B) fitting.
 - C) developing.
 - D) happening.

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Week 3

Task 1

Questions 1-10 are based on the following passage.

This passage is adapted from Saki, "The Scharitz-Metterklume Method." Originally published in 1911.

Lady Carlotta stepped out on to the platform of the small wayside station and took a turn or two up and down its uninteresting length, to kill time till the
Line train should be pleased to proceed on its way. Then,
5 in the roadway beyond, she saw a horse struggling with a more than ample load, and a carter of the sort that seems to bear a sullen hatred against the animal that helps him to earn a living. Lady Carlotta promptly betook her to the roadway, and put rather a
10 different complexion on the struggle. Certain of her acquaintances were wont to give her plentiful admonition as to the undesirability of interfering on behalf of a distressed animal, such interference being
"none of her business." Only once had she put the
15 doctrine of non-interference into practice, when one of its most eloquent exponents had been besieged for nearly three hours in a small and extremely uncomfortable may-tree by an angry boar-pig, while Lady Carlotta, on the other side of the fence, had
20 proceeded with the water-colour sketch she was engaged on, and refused to interfere between the boar and his prisoner. It is to be feared that she lost the friendship of the ultimately rescued lady. On this occasion she merely lost the train, which gave way to
25 the first sign of impatience it had shown throughout the journey, and steamed off without her. She bore the desertion with philosophical indifference; her

friends and relations were thoroughly well used to the fact of her luggage arriving without her.

30 She wired a vague non-committal message to her destination to say that she was coming on "by another train." Before she had time to think what her next move might be she was confronted by an imposingly attired lady, who seemed to be taking a
35 prolonged mental inventory of her clothes and looks.

"You must be Miss Hope, the governess I've come to meet," said the apparition, in a tone that admitted of very little argument.

40 "Very well, if I must I must," said Lady Carlotta to herself with dangerous meekness.

"I am Mrs. Quabarl," continued the lady; "and where, pray, is your luggage?"

"It's gone astray," said the alleged governess, falling in with the excellent rule of life that the absent
45 are always to blame; the luggage had, in point of fact, behaved with perfect correctitude. "I've just telegraphed about it," she added, with a nearer approach to truth.

"How provoking," said Mrs. Quabarl; "these
50 railway companies are so careless. However, my maid can lend you things for the night," and she led the way to her car.

During the drive to the Quabarl mansion Lady Carlotta was impressively introduced to the
55 nature of the charge that had been thrust upon her; she learned that Claude and Wilfrid were delicate, sensitive young people, that Irene had the artistic temperament highly developed, and that Viola was

something or other else of a mould equally
60 commonplace among children of that class and type in the twentieth century.

"I wish them not only to be TAUGHT," said Mrs. Quabarl, "but INTERESTED in what they learn. In their history lessons, for instance, you must try to
65 make them feel that they are being introduced to the life-stories of men and women who really lived, not merely committing a mass of names and dates to memory. French, of course, I shall expect you to talk at meal-times several days in the week."

70 "I shall talk French four days of the week and Russian in the remaining three."

"Russian? My dear Miss Hope, no one in the house speaks or understands Russian."

"That will not embarrass me in the least," said
75 Lady Carlotta coldly.

Mrs. Quabarl, to use a colloquial expression, was knocked off her perch. She was one of those imperfectly self-assured individuals who are magnificent and autocratic as long as they are not
80 seriously opposed. The least show of unexpected resistance goes a long way towards rendering them cowed and apologetic. When the new governess failed to express wondering admiration of the large newly-purchased and expensive car, and lightly
85 alluded to the superior advantages of one or two makes which had just been put on the market, the discomfiture of her patroness became almost abject. Her feelings were those which might have animated a general of ancient warfaring days, on beholding his
90 heaviest battle-elephant ignominiously driven off the field by slingers and javelin throwers.

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1. Which choice best summarizes the passage?
 - A) A woman weighs the positive and negative aspects of accepting a new job.
 - B) A woman does not correct a stranger who mistakes her for someone else.
 - C) A woman impersonates someone else to seek revenge on an acquaintance.
 - D) A woman takes an immediate dislike to her new employer.
2. In line 2, “turn” most nearly means
 - A) slight movement.
 - B) change in rotation.
 - C) short walk.
 - D) course correction.
3. The passage most clearly implies that other people regarded Lady Carlotta as
 - A) outspoken.
 - B) tactful.
 - C) ambitious.
 - D) unfriendly.
4. Which choice provides the best evidence for the answer to the previous question?
 - A) Lines 10-14 (“Certain... business”)
 - B) Lines 22-23 (“It is... lady”)
 - C) Lines 23-26 (“On this... her”)
 - D) Lines 30-32 (“She... train”)
5. The description of how Lady Carlotta “put the doctrine of non-interference into practice” (lines 14-15) mainly serves to
 - A) foreshadow her capacity for deception.
 - B) illustrate the subtle cruelty in her nature.
 - C) provide a humorous insight into her character.
 - D) explain a surprising change in her behavior.
6. In line 55, “charge” most nearly means
 - A) responsibility.
 - B) attack.
 - C) fee.
 - D) expense.
7. The narrator indicates that Claude, Wilfrid, Irene, and Viola are
 - A) similar to many of their peers.
 - B) unusually creative and intelligent.
 - C) hostile to the idea of a governess.
 - D) more educated than others of their age.

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8. The narrator implies that Mrs. Quabarl favors a form of education that emphasizes
- A) traditional values.
 - B) active engagement.
 - C) artistic experimentation.
 - D) factual retention.
9. As presented in the passage, Mrs. Quabarl is best described as
- A) superficially kind but actually selfish.
 - B) outwardly imposing but easily defied.
 - C) socially successful but irrationally bitter.
 - D) naturally generous but frequently imprudent.
10. Which choice provides the best evidence for the answer to the previous question?
- A) Lines 49-50 ("How... careless")
 - B) Lines 62-68 ("I wish... memory")
 - C) Lines 70-73 ("I shall... Russian")
 - D) Lines 77-82 ("She was... apologetic")

Task 2

This passage is adapted from George Eliot, *Silas Marner*. Originally published in 1861. Silas was a weaver and a notorious miser, but then the gold he had hoarded was stolen. Shortly after, Silas adopted a young child, Eppie, the daughter of an impoverished woman who had died suddenly.

Unlike the gold which needed nothing, and must be worshipped in close-locked solitude—which was hidden away from the daylight, was deaf to the song of birds, and started to no human tones—Eppie was a creature of endless claims and ever-growing desires, seeking and loving sunshine, and living sounds, and living movements; making trial of everything, with trust in new joy, and stirring the human kindness in all eyes that looked on her. The gold had kept his thoughts in an ever-repeated circle, leading to nothing beyond itself; but Eppie was an object compacted of changes and hopes that forced his thoughts onward, and carried them far away from their old eager pacing towards the same blank limit—carried them away to the new things that would come with the coming years, when Eppie would have learned to understand how her father Silas cared for her; and made him look for images of that time in the ties and charities that bound together the families of his neighbors. The gold had asked that

he should sit weaving longer and longer, deafened and blinded more and more to all things except the monotony of his loom and the repetition of his web; but Eppie called him away from his weaving, and made him think all its pauses a holiday, reawakening his senses with her fresh life, even to the old winter-flies that came crawling forth in the early spring sunshine, and warming him into joy because she had joy.

And when the sunshine grew strong and lasting, so that the buttercups were thick in the meadows, Silas might be seen in the sunny mid-day, or in the late afternoon when the shadows were lengthening under the hedgerows, strolling out with uncovered head to carry Eppie beyond the Stone-pits to where the flowers grew, till they reached some favorite bank where he could sit down, while Eppie toddled to pluck the flowers, and make remarks to the winged things that murmured happily above the bright petals, calling "Dad-dad's" attention continually by bringing him the flowers. Then she would turn her ear to some sudden bird-note, and Silas learned to please her by making signs of hushed stillness, that they might listen for the note to come again: so that when it came, she set up her small back and laughed with gurgling triumph. Sitting on the banks in this way, Silas began to look for the once familiar herbs again; and as the leaves, with their unchanged outline and markings, lay on his palm, there was a sense of crowding remembrances from which he turned away timidly, taking refuge in Eppie's little world, that lay lightly on his enfeebled spirit.

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As the child's mind was growing into knowledge,
his mind was growing into memory: as her life
55 unfolded, his soul, long stupefied in a cold narrow
prison, was unfolding too, and trembling gradually
into full consciousness.

It was an influence which must gather force with
every new year: the tones that stirred Silas' heart
60 grew articulate, and called for more distinct answers;
shapes and sounds grew clearer for Eppie's eyes and
ears, and there was more that "Dad-dad" was
imperatively required to notice and account for.
Also, by the time Eppie was three years old, she
65 developed a fine capacity for mischief, and for
devising ingenious ways of being troublesome, which
found much exercise, not only for Silas' patience, but
for his watchfulness and penetration. Sorely was poor
Silas puzzled on such occasions by the incompatible
70 demands of love.

1. Which choice best describes a major theme of the passage?
 - A) The corrupting influence of a materialistic society
 - B) The moral purity of young children
 - C) The bittersweet brevity of childhood naïveté
 - D) The restorative power of parental love
2. As compared with Silas's gold, Eppie is portrayed as having more
 - A) vitality.
 - B) durability.
 - C) protection.
 - D) self-sufficiency.
3. Which statement best describes a technique the narrator uses to represent Silas's character before he adopted Eppie?
 - A) The narrator emphasizes Silas's former obsession with wealth by depicting his gold as requiring certain behaviors on his part.
 - B) The narrator underscores Silas's former greed by describing his gold as seeming to reproduce on its own.
 - C) The narrator hints at Silas's former antisocial attitude by contrasting his present behavior toward his neighbors with his past behavior toward them.
 - D) The narrator demonstrates Silas's former lack of self-awareness by implying that he is unable to recall life before Eppie.
4. The narrator uses the phrase "making trial of everything" (line 7) to present Eppie as A)
 - friendly.
 - B) curious.
 - C) disobedient.
 - D) judgmental.

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5. According to the narrator, one consequence of Silas adopting Eppie is that he
 - A) has renounced all desire for money.
 - B) better understands his place in nature.
 - C) seems more accepting of help from others.
 - D) looks forward to a different kind of future.
6. Which choice provides the best evidence for the answer to the previous question? A) Lines 9-11 ("The gold... itself")
 - B) Lines 11-16 ("but Eppie... years")
 - C) Lines 41-43 ("Then... stillness")
 - D) Lines 61-63 ("shapes... for")
7. What function does the second paragraph (lines 30-52) serve in the passage as a whole?
 - A) It presents the particular moment at which Silas realized that Eppie was changing him.
 - B) It highlights Silas's love for Eppie by depicting the sacrifices that he makes for her.
 - C) It illustrates the effect that Eppie has on Silas by describing the interaction between them.
 - D) It reveals a significant alteration in the relationship between Silas and Eppie.
8. In describing the relationship between Eppie and Silas, the narrator draws a connection between Eppie's
 - A) physical vulnerability and Silas's emotional fragility.
 - B) expanding awareness and Silas's increasing engagement with life.
 - C) boundless energy and Silas's insatiable desire for wealth.
 - D) physical growth and Silas's painful perception of his own mortality.
9. Which choice provides the best evidence for the answer to the previous question?
 - A) Lines 1-9 ("Unlike... her")
 - B) Lines 30-41 ("And when... flowers")
 - C) Lines 46-48 ("Sitting... again")
 - D) Lines 53-57 ("As the... consciousness")
10. As used in line 65, "fine" most nearly means
 - A) acceptable.
 - B) delicate.
 - C) ornate.
 - D) keen.

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Week 4

Task 1

This passage is adapted from Emily Anthes, *Frankenstein's Cat*. ©2013 by Emily Anthes.

When scientists first learned how to edit the genomes of animals, they began to imagine all the ways they could use this new power. Creating brightly colored novelty pets was not a high priority.

5 Instead, most researchers envisioned far more consequential applications, hoping to create genetically engineered animals that saved human lives. One enterprise is now delivering on this dream. Welcome to the world of "pharming," in which
10 simple genetic tweaks turn animals into living pharmaceutical factories.

Many of the proteins that our cells crank out naturally make for good medicine. Our bodies' own enzymes, hormones, clotting factors, and antibodies
15 are commonly used to treat cancer, diabetes, autoimmune diseases, and more. The trouble is that it's difficult and expensive to make these compounds on an industrial scale, and as a result, patients can face shortages of the medicines they need. Dairy
20 animals, on the other hand, are expert protein producers, their udders swollen with milk. So the creation of the first transgenic animals—first mice, then other species—in the 1980s gave scientists an idea: What if they put the gene for a human antibody
25 or enzyme into a cow, goat, or sheep? If they put the gene in just the right place, under the control of the right molecular switch, maybe they could engineer animals that produced healing human proteins in their milk. Then doctors could collect medicine by
30 the bucketful.

Throughout the 1980s and '90s, studies provided proof of principle, as scientists created transgenic mice, sheep, goats, pigs, cattle, and rabbits that did in fact make therapeutic compounds in their milk.

35 At first, this work was merely gee-whiz, scientific geekery, lab-bound thought experiments come true. That all changed with ATryn, a drug produced by the Massachusetts firm GTC Biotherapeutics. ATryn is antithrombin, an anticoagulant that can be used to
40 prevent life-threatening blood clots. The compound, made by our liver cells, plays a key role in keeping our bodies clot-free. It acts as a molecular bouncer, sidling up to clot-forming compounds and escorting them out of the bloodstream. But as many as 1 in

45 2,000 Americans are born with a genetic mutation that prevents them from making antithrombin. These patients are prone to clots, especially in their legs and lungs, and they are at elevated risk of suffering from fatal complications during surgery and childbirth. Supplemental antithrombin can
50 reduce this risk, and GTC decided to try to manufacture the compound using genetically engineered goats.

To create its special herd of goats, GTC used
55 microinjection, the same technique that produced GloFish and AquAdvantage salmon. The company's scientists took the gene for human antithrombin and injected it directly into fertilized goat eggs. Then they implanted the eggs in the wombs of female goats.
60 When the kids were born, some of them proved to be transgenic, the human gene nestled safely in their cells. The researchers paired the antithrombin gene with a promoter (which is a sequence of DNA that controls gene activity) that is normally active in the
65 goat's mammary glands during milk production. When the transgenic females lactated, the promoter turned the transgene on and the goats' udders filled with milk containing antithrombin. All that was left to do was to collect the milk, and extract and purify
70 the protein. *Et voilà*—human medicine! And, for GTC, liquid gold. ATryn hit the market in 2006, becoming the world's first transgenic animal drug. Over the course of a year, the "milking parlors" on GTC's 300-acre farm in Massachusetts can collect
75 more than a kilogram of medicine from a single animal.

1. The primary purpose of the passage is to
 - A) present the background of a medical breakthrough.
 - B) evaluate the research that led to a scientific discovery.
 - C) summarize the findings of a long-term research project.
 - D) explain the development of a branch of scientific study.
2. The author's attitude toward pharming is best described as one of
 - A) apprehension.
 - B) ambivalence.
 - C) appreciation.
 - D) astonishment.

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3. As used in line 20, “expert” most nearly means
 - A) knowledgeable.
 - B) professional.
 - C) capable.
 - D) trained.
4. What does the author suggest about the transgenic studies done in the 1980s and 1990s?
 - A) They were limited by the expensive nature of animal research.
 - B) They were not expected to yield products ready for human use.
 - C) They were completed when an anticoagulant compound was identified.
 - D) They focused only on the molecular properties of cows, goats, and sheep.
5. Which choice provides the best evidence for the answer to the previous question?
 - A) Lines 16-19 (“The trouble... need”)
 - B) Lines 25-29 (“If they... milk”)
 - C) Lines 35-36 (“At first... true”)
 - D) Lines 37-40 (“That all... clots”)
6. According to the passage, which of the following is true of antithrombin?
 - A) It reduces compounds that lead to blood clots.
 - B) It stems from a genetic mutation that is rare in humans.
 - C) It is a sequence of DNA known as a promoter.
 - D) It occurs naturally in goats’ mammary glands
7. Which choice provides the best evidence for the answer to the previous question?
 - A) Lines 12-16 (“Many... more”)
 - B) Lines 42-44 (“It acts... bloodstream”)
 - C) Lines 44-46 (“But as... antithrombin”)
 - D) Lines 62-65 (“The researchers... production”)
8. Which of the following does the author suggest about the “female goats” mentioned in line 59?
 - A) They secreted antithrombin in their milk after giving birth.
 - B) Some of their kids were not born with the antithrombin gene.
 - C) They were the first animals to receive microinjections.
 - D) Their cells already contained genes usually found in humans.
9. The most likely purpose of the parenthetical information in lines 63-64 is to
 - A) illustrate an abstract concept.
 - B) describe a new hypothesis.
 - C) clarify a claim.
 - D) define a term.

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10. The phrase “liquid gold” (line 71) most directly suggests that
- A) GTC has invested a great deal of money in the microinjection technique.
 - B) GTC’s milking parlors have significantly increased milk production.
 - C) transgenic goats will soon be a valuable asset for dairy farmers.
 - D) ATryn has proved to be a financially beneficial product for GTC.

Task 2

This passage is from Charlotte Brontë, *The Professor*, originally published in 1857.

No man likes to acknowledge that he has made a mistake in the choice of his profession, and every man, worthy of the name, will row long against wind and tide before he allows himself to cry out, “I am baffled!” and submits to be floated passively back to land. From the first week of my residence in X— I felt my occupation irksome. The thing itself—the work of copying and translating business-letters— was a dry and tedious task enough, but had that been all, I should long have borne with the nuisance; I am not of an impatient nature, and influenced by the double desire of getting my living and justifying to myself and others the resolution I had taken to become a tradesman, I should have endured in silence the rust and cramp of my best faculties; I should not have whispered, even inwardly, that I longed for liberty; I should have pent in every sigh by which my heart might have ventured to intimate its distress under the closeness, smoke, monotony, and joyless tumult of Bigben Close, and its panting desire for freer and fresher scenes; I should have set up the image of Duty, the fetish of Perseverance, in my small bedroom at Mrs. King’s lodgings, and they two should have been my household gods, from which

my darling, my cherished-in-secret, Imagination, the tender and the mighty, should never, either by softness or strength, have severed me. But this was not all; the antipathy which had sprung up between myself and my employer striking deeper root and spreading denser shade daily, excluded me from every glimpse of the sunshine of life; and I began to feel like a plant growing in humid darkness out of the slimy walls of a well.

Antipathy is the only word which can express the feeling Edward Crimsworth had for me—a feeling, in a great measure, involuntary, and which was liable to be excited by every, the most trifling movement, look, or word of mine. My southern accent annoyed him; the degree of education evinced in my language irritated him; my punctuality, industry, and accuracy, fixed his dislike, and gave it the high flavour and poignant relish of envy; he feared that I too should one day make a successful tradesman. Had I been in anything inferior to him, he would not have hated me so thoroughly, but I knew all that he knew, and, what was worse, he suspected that I kept the padlock of silence on mental wealth in which he was no sharer. If he could have once placed me in a ridiculous or mortifying position, he would have forgiven me much, but I was guarded by three faculties—Caution, Tact, Observation; and prowling and prying as was Edward’s malignity, it could never baffle the lynx-eyes of these, my natural sentinels. Day by day did his malice watch my tact, hoping it would sleep, and prepared to steal snake-like on its slumber; but tact, if it be genuine, never sleeps.

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I had received my first quarter's wages, and was returning to my lodgings, possessed heart and soul with the pleasant feeling that the master who had paid me grudged every penny of that hard-earned pittance—(I had long ceased to regard Mr. Crimsworth as my brother—he was a hard, grinding master; he wished to be an inexorable tyrant: that was all). Thoughts, not varied but strong, occupied my mind; two voices spoke within me; again and again they uttered the same monotonous phrases. One said: "William, your life is intolerable." The other: "What can you do to alter it?" I walked fast, for it was a cold, frosty night in January; as I approached my lodgings, I turned from a general view of my affairs to the particular speculation as to whether my fire would be out; looking towards the window of my sitting-room, I saw no cheering red gleam.

1. Which choice best summarizes the passage?
 - A) A character describes his dislike for his new job and considers the reasons why.
 - B) Two characters employed in the same office become increasingly competitive.
 - C) A young man regrets privately a choice that he defends publicly.
 - D) A new employee experiences optimism, then frustration, and finally despair.
2. The main purpose of the opening sentence of the passage is to
 - A) establish the narrator's perspective on a controversy.
 - B) provide context useful in understanding the narrator's emotional state.
 - C) offer a symbolic representation of Edward Crimsworth's plight.
 - D) contrast the narrator's good intentions with his malicious conduct.
3. During the course of the first paragraph, the narrator's focus shifts from
 - A) recollection of past confidence to acknowledgment of present self-doubt.
 - B) reflection on his expectations of life as a tradesman to his desire for another job.
 - C) generalization about job dissatisfaction to the specifics of his own situation.
 - D) evaluation of factors making him unhappy to identification of alternatives.
4. The references to "shade" and "darkness" at the end of the first paragraph mainly have which effect?
 - A) They evoke the narrator's sense of dismay.
 - B) They reflect the narrator's sinister thoughts.
 - C) They capture the narrator's fear of confinement.
 - D) They reveal the narrator's longing for rest.

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5. The passage indicates that Edward Crimsworth's behavior was mainly caused by his
 - A) impatience with the narrator's high spirits.
 - B) scorn of the narrator's humble background.
 - C) indignation at the narrator's rash actions.
 - D) jealousy of the narrator's apparent superiority.
6. The passage indicates that when the narrator began working for Edward Crimsworth, he viewed Crimsworth as a
 - A) harmless rival.
 - B) sympathetic ally.
 - C) perceptive judge.
 - D) demanding mentor.
7. Which choice provides the best evidence for the answer to the previous question?
 - A) Lines 28-31 ("the antipathy... life")
 - B) Lines 38-40 ("My southern... irritated him")
 - C) Lines 54-56 ("Day... slumber")
 - D) Lines 61-62 ("I had... brother")
8. At the end of the second paragraph, the comparisons of abstract qualities to a lynx and a snake mainly have the effect of
 - A) contrasting two hypothetical courses of action.
 - B) conveying the ferocity of a resolution.
 - C) suggesting the likelihood of an altercation.
 - D) illustrating the nature of an adversarial relationship.
9. The passage indicates that, after a long day of work, the narrator sometimes found his living quarters to be
 - A) treacherous.
 - B) dreary.
 - C) predictable.
 - D) intolerable.
10. Which choice provides the best evidence for the answer to the previous question?
 - A) Lines 17-21 ("I should... scenes")
 - B) Lines 21-23 ("I should... lodgings")
 - C) Lines 64-67 ("Thoughts... phrases")
 - D) Lines 68-74 ("I walked... gleam")

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Appendix D

Anxiety Assessment Measure

Please circle the number that relates to how you currently believe your person identifies with the following *italicized* characteristics (ex: I feel very alive and awake, I would circle 5 for the characteristic of being energetic)

1. *Worried*

1	2	3	4	5
Not at all	Not really	None	Kind of	Very much

2. *Confident*

1	2	3	4	5
Not at all	Not really	None	Kind of	Very much

3. *Irritable*

1	2	3	4	5
Not at all	Not really	None	Kind of	Very much

4. *Energetic*

1	2	3	4	5
Not at all	Not really	None	Kind of	Very much

5. *Tense*

1	2	3	4	5
Not at all	Not really	None	Kind of	Very much

6. *Fearful*

1	2	3	4	5
Not at all	Not really	None	Kind of	Very much

7. *Excited*

1	2	3	4	5
Not at all	Not really	None	Kind of	Very much

8. *Focused*

1	2	3	4	5
Not at all	Not really	None	Kind of	Very much

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Appendix E

Musical Experiences Questionnaire (MEQ)

Brief Music Experience Questionnaire

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Instructions: This questionnaire concerns the place of music in your life. Questions concern your thoughts about music, your feelings about it, your reactions to it, and how it relates to your activities. There are no right or wrong answers to these questions. After reading each question carefully, indicate how true it is of your experience and behavior, using the following scale:

- 1 = Very untrue
- 2 = Somewhat untrue
- 3 = Equally true and untrue; unsure
- 4 = Somewhat true
- 5 = Very true

Please indicate your answer in the space next to each question. Please use a #2 pencil, and erase completely if you want to change an answer.

SCALE ASSIGNMENTS

Following each item is an indication of whether it is reverse keyed, its scale assignment, and its item number in the 141 item MEQ question booklet

C = Commitment to music
I = Innovative musical aptitude
S = Social uplift
A = Affective reactions
P = Positive psychotropic effects
R = Reactive musical behavior

** Item is reverse keyed*

- ___ 1. I can easily improvise on an instrument without having music in front of me. I 24.
- ___ 2 I frequently hear songs in my head. R 122.
- ___ 3. I feel more integrated (more "together") when I hear certain kinds of music. P 91.
- ___ 4. I often sing, hum, or whistle along with recorded music. R 67.
- ___ 5. I would never want to listen to the same piece of music twice in a row. *A 77.
- ___ 6. When I'm enjoying music with other people I feel like we're speaking the same language. P 135.
- ___ 7. I've had musical experiences that have changed my whole mood. P 104.

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- ___ 8. I enjoy singing in the shower or bath. R 117.
- ___ 9. I sometimes spend more money than I can afford to attend a musical performance. C 2.
- ___ 10. It is hard for me to keep the beat when dancing. *R 21.
- ___ 11. Music unites my mind and my body. P 136.
- ___ 12. A song has never made me feel joyous. *A 123.
- ___ 13. I like listening to music that has a message. A 49.
- ___ 14. There's nothing more powerful than singing a beloved song with other people. S 69.
- ___ 15. Listening to music is a very private experience for me. C 128.
- ___ 16. I wish my family had sung together more when I was growing up. S 65.
- ___ 17. I have perfect pitch. I 111.
- ___ 18. When they are done well, I find patriotic songs very stirring. S 52.
- ___ 19. I wish music had been more a part of my childhood. S 29.
- ___ 20. I have never been physically stirred up by music. *A 137.
- ___ 21. Music is the most important thing in my life. C 68.
- ___ 22. Music helps me forget my cares. P 27.
- ___ 23. Totally new tunes, that I've never heard before, sometimes pop into my head. I 39.
- ___ 24. I can hardly resist dancing to certain music. R 78.
- ___ 25. Music gives me a sense of purpose and movement. P 138.
- ___ 26. The experience of music brings me closer to a higher power. P 119.
- ___ 27. I am especially responsive to the beat or rhythm in music. R 42.
- ___ 28. People have applauded my performance of music. I 130.
- ___ 29. I enjoy making up or composing tunes, songs or musical pieces. I 28.
- ___ 30. I have a good sense of pitch. I 114.
- ___ 31. I easily get "lost" in the depth of my concentration on music. P 86.
- ___ 32. I often find myself swaying in tune with music to which I'm listening. R 10.
- ___ 33. Music never affects my feelings. *A 107.
- ___ 34. Music has no place in my life. *A 85.
- ___ 35. Music helps me get out of myself. P 93.
- ___ 36. Certain music draws me strongly to dance. R 99.
- ___ 37. I have made sacrifices in my life in the pursuit of music. C 56.
- ___ 38. I follow the details of certain musical performers' lives. C 57.
- ___ 39. I love some kinds of music. A 76.
- ___ 40. Sometimes I spend too much money on musical recordings or music videos. C 37.
- ___ 41. It's important for me to see music being performed and not just hear it. C 64.

- ___ 42. Music helps me not feel so lonely. P 31.
- ___ 43. Often I tap my feet or hands along with music I'm hearing. R 30.
- ___ 44. I am better able to face the world after enjoying music. P 141.
- ___ 45. The emotional side of music makes me uncomfortable. *A 60.
- ___ 46. There are some kinds of music that I really detest. A 50.
- ___ 47. I've been *both* aroused and satisfied by a musical experience. P 134.
- ___ 48. Music gives a sense of order to my life. P 140.
- ___ 49. I'm pretty good at improvising music, either in my head or on an instrument. I 16.
- ___ 50. Hearing a song will sometimes bring to my mind a period of my life. A 96.
- ___ 51. Music can influence my emotions. P 82.
- ___ 52. Life would be meaningless to me without music. P 34.
- ___ 53. I've had experiences of ecstasy while listening to music. P 55.

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Appendix F

Anxiety by Sound Condition (descriptively)

The following graphs depict the impact of anxiety difference by sound condition on secondary/experimental test performance. There was not a significant impact of anxiety on test performance, so this information was examined post-hoc, exploratorily, and descriptively to see if there were any trends suggesting different anxiety scores across different sound conditions. The information depicted is raw data with anxiety difference on the x-axis (negative scores depicting decreases in anxiety and positive scores depicting increases) and test performance on the y-axis.

Figure F1. A scatter plot exploring anxiety difference (x-axis) on performance (y-axis) in the silence sound condition.

Figure F2. A scatter plot exploring anxiety difference (x-axis) on performance (y-axis) in the preferred music condition.

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Figure F3. A scatter plot exploring anxiety difference (x-axis) on performance (y-axis) in the non-preferred music condition.

Figure F4. A scatter plot exploring anxiety difference (x-axis) on performance (y-axis) in the ambient sound condition.

Appendix G

Anxiety Interactions in Multivariate Models

The following multivariate model is an exploratory conditional plot conducted post-hoc that attempts to look at anxiety and performance as the effects of sound condition and baseline performance were held constant. In this model, as anxiety increased participants appeared to perform better in the ambient/white noise condition and worse in the silence condition.

Figure G1. A multivariate model that keeps the effect of sound condition constant while exploring the impact of anxiety difference (with the interaction of the sound condition) on test performance in the experimental condition.

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The following multivariate model is an exploratory conditional plot conducted post-hoc that attempts to look at baseline anxiety and performance as the effects of sound condition and baseline performance were held constant. In this model, if participants came in with high anxiety they were more likely to perform worse in the ambient/white noise condition and better in the silence condition.

Figure G2. A multivariate model that keeps the effect of baseline accuracy constant while exploring the impact of anxiety difference (with the interaction of baseline accuracy) on test performance in the experimental condition.