

Graduate Research Plan Statement

Memory and music have been compared and linked for the greater part of a century (Baird, 1917), and sight reading—the ability many musicians possess to read and play a passage of music the first time they see it—has more recently become the focus of discussion. The first cognitive model of sight reading (of which memory was a significant component) was proposed by Thomas Wolf only a few decades ago (1976), and a strong working memory was specifically found to be a predictor of sight reading ability (Mishra, 2014). In 1998, researchers found that a good working memory is necessary for effective sight reading, explaining that pattern recognition and memory of such patterns correlated the most strongly with sight reading out of all variables tested (Waters, Townsend, & Underwood, 1998), such that a musician who can sight read usually has strong short-term memory skills. Scholars have demonstrated that sight reading can be learned (Grutzmacher, 1987) and working memory can be improved (Alloway & Alloway, 2009), but what has not been examined is potential causation: Can developing sight reading skills positively affect one’s working memory?

Broadly, this study aims to examine if sight reading positively affects short-term memory. Specifically, I am interested in looking at how a regimented sight reading curriculum can improve performance on memory and cognitive tasks. The study will feature two groups of participants. Each group will be comprised of 20–30 adults age 18–24 with some prior piano training. One group will receive sight reading training (see below), and one will not. I will screen potential participants using a variety of measures, including:

- The Wechsler Memory Scale to screen for disabilities and other compounding cognitive factors.
- The Standard Assessment of Sight Reading to ensure participants’ existing sight reading abilities are within the appropriate range.
- Behavioral survey about alcohol and drug use.

I have negotiated an agreement with the developers of Read Ahead, an app designed to teach sight reading to people who have at least a minimal musical background. They will license their software for this research study at a discounted rate. Read Ahead’s sight reading curriculum is delivered to end users via 36 daily lessons, which will be completed in 12 weeks. Participants will be assessed twice: Once at the beginning of the study to obtain baseline values and again at the end to record and evaluate any changes in performance (sight reading, memory, etc). I expect noncontrol participants to experience improvements in working memory task performance. The study will require that participants have an iPad or that one is provided to them. Participants will also need to be compensated for their time.

Intellectual Merit

I have studied violin for 19 years, including seven at The Juilliard School Pre-College Program from which I graduated in 2016, where I took many courses that extended music and its applications to real-world contexts. The most transformative such class for me was Psychology of Top Performers, which focused on applied music psychology. The course was pioneered by Dr. Noa Kageyama, with whom I have consulted about my project’s development. Through Juilliard I also came to know neurologist and important mentor Dr. Steven Frucht, Director of Movement Disorders at New York University, who often shared with me interesting studies about music and movement disorders.

Upon realizing that this was a timely, dynamic field in which I could make some significant contributions, I began my research at the Johns Hopkins Medical Institute Center for Music and Medicine during my freshman year of college working under the leadership of

principle investigators Alexander Pantelyat, MD, and Serap Bastepe-Gray, MD. The studies I in which I participated as a researcher include Guitar-PD, a project that taught 24 people with moderate to advanced Parkinson's disease to play guitar. We demonstrated a positive correlation between guitar playing and improvements in participants' quality of life/upper extremity function. The paper will be published in 2020. I also worked on Drum-PDHD, wherein we examined how patients with Parkinson's and Huntington's responded to group drum therapy.

Broader Impacts

K-12 and university arts funding are being cut nationwide (Wilkinson, 2017). Nevertheless, there is hope, as the National Institutes of Health recognizes the significance of music on brain development and is funding research in this field accordingly. In recent years, memory has dominated the publicly evaluated side of cognitive psychology. Increased diagnoses of Alzheimer's disease and other forms of dementia have increased awareness of the importance of maintaining a good memory. Brain-training apps, such as Lumosity and Elevate, have become major bestsellers, with the former garnering almost 50 million users by 2014. Despite reported invalidity of apps like these (Simons, Boot, Charness, Gathercole, Chabris, Hambrick, & Stine-Morrow, 2016), humans seem to continually strive to improve remembering.

My study will provide a concrete, scientific determination that music is essential for human development, most notably from the pragmatic perspective of memory sustenance. All of the pieces are currently in place for this project to be a success: Sight reading is closely associated with working memory and both can be taught and improved. It is therefore reasonable to suggest that these go hand-in-hand, and that sight reading could be a natural, non-medication-based memory-improvement tool applicable to populations of all ages. For example, people with ADHD often lack working memory skills. Sight reading may provide them with a means for improvement through music instruction. (This will of course require much additional research). The implications of my project's potential stretch far beyond cognitive psychology: this study has the potential to shape musical pedagogy, benefit neurologically disadvantaged individuals, and influence how we approach STEM (or, rather, STEAM) education and discussion.

The success of this research project would add merit to the quickly expanding field of cognitive neuropsychology of music. Alternative treatments and cognitive improvements are now needed more than ever, which is why the Johns Hopkins Center for Music and Medicine has devoted so much time studying them as they relate to movement disorders. With my unique and proven background in music theory/performance and cognitive neuropsychology, I am well poised to conduct research in a burgeoning field that examines art and aesthetic as a means of cognitive treatment and improvement.

References

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