Music and Its Effects on Performance

Introduction:

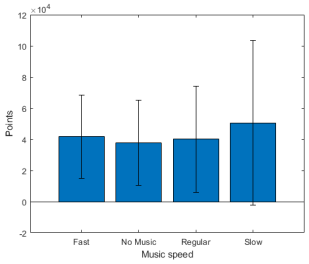
The purpose of this study was to determine the effects of music on repetitive, skill based tasks and how those effects could be applied in the workplace. The study was done by comparing performance in the game of Tetris between subjects listening to the same music at different speeds (or with no music altogether). While results of these experiments were somewhat inconclusive, it was found that subjects not listening to music performed consistently scored lower than those who did not. From here, it can be concluded that the presence of music does have a positive impact on performance and these findings can be used as a starting point for future research. Going off of this finding, we need to perform future tests focusing on factory work to see the extent of performance. Tests should be done with a variety of styles of music among workers of similar experience levels. The end goal of this is to find if the positive impact of music on performance is great enough to offset the costs saved from workplace automation and keep a human element in factory work to keep workers in their jobs.

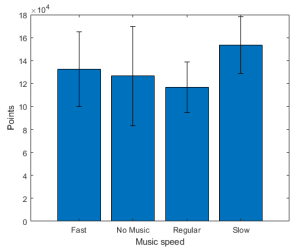
Background

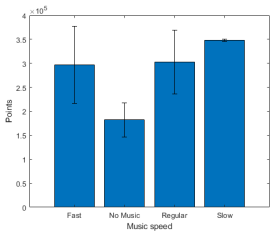
Prior to the findings of our study, there are a few key findings from prior studies that are important to consider. The findings of these studies are somewhat mixed in regard to the impact of music on performance. Research towards a positive correlation between music and performance includes a 1973 study finding that arithmetic problems were best performed in with music as background noise (Wolf & Weiner, 1972), a 1988 study finding that college students who heard pop music 20 minutes before the start of class earned higher grades than students that didn't (Schreiber, 1988), and a 1959 study finding that music increased production in firms (Roberts, 1959). Conflicting with these results, a 1973 study found that eight graders performed worse on reading test scores with music (Fogelson, 1973) and a 1976 study found that college students performed worse on the Stroop color-word task with music (Parente, 1976). Finally, there were also studies finding that music had no effect altogether like a 1987 study finding that students who perceived background music as distracting had no change in scores compared to students who did not (Madsen, 1987) and a 1988 study finding that classical, jazz, and pop music had no effect on hand-eye coordination (Sogin, 1988).

With these mixed results, we realized that the only option was to perform an experiment of our own. For our study, we had seven subjects self-categorized as beginner, intermediate, and expert Tetris players play Tetris with slow music, fast music, normal paced music, and no music. The order in which these songs were played was randomized and all songs were the same base song played at different speeds. The scores at the end of the game were recorded and we plotted the results. Our study found that novice players performed best with slow music followed by fast, then regular, then no music. Intermediate players performed best with slow music followed

by fast music, followed by no music, followed by regular music. Expert players performed best with slow music followed by regular followed by fast, followed by no music.







Analysis and Arguments:

While the overall findings of our studies were quite mixed, there were signs that the presence of music does create a positive impact in Tetris performance compared to runs without any music. In two of the experimental groups (novice and expert), no music performed worse on average than all other categories. This preference for music to be playing is also backed through various observations the experimental subjects commented on throughout the tests. Even in the intermediate group, no music performed worse than fast and slow music and was very close to being the lowest scoring category. Additionally, the fact that there were differences between the game scores for different types of music at all indicates that music will have impacts on performance.

Due to the large variance in both our own results and the background research, future testing is needed with both a larger sample size and more specifically related to the direction we want to apply this research in. We believe that this data can most effectively be used for factory work to determine if workers should be replaced with automation so our future research will be focused there. Estimates predict that up to 8.5% of the manufacturing workforce will be replaced by automation in the near future (Lambert & Cone, 2019). As factory work has a similar sort of repetitive, skill based task that Tetris is, there is a good chance that music can have a positive impact on performance there as well. The cost of robot automation falls by around 11% every five years (Lambert & Cone, 2019) making it more and more of a tempting direction to go in as time goes by, but if we can find a way to increase worker efficiency naturally through the use of music, we can avoid automation and increase productivity without resulting in the loss of jobs.

References

Fogelson, S. (1973). Music as a Distractor on Reading-Test Performance of Eighth Grade Students. *Perceptual and Motor Skills, 36*(3_suppl), 1265–1266. https://doi.org/10.2466/pms.1973.36.3c.1265

Grimshaw, M., Tan, S.-L., & Lipscomb, S. D. (2013). *Playing with sound: The role of music and sound effects in gaming.* In S.-L. Tan, A. J. Cohen, S. D. Lipscomb, & R. A. Kendall (Eds.), The psychology of music in multimedia (pp. 289–314). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199608157.003.0013

Hunter P.G., Schellenberg E.G. (2010). Music and Emotion. In: Riess Jones M., Fay R., Popper A. (eds) Music Perception. *Springer Handbook of Auditory Research*, vol 36. Springer, New York, NY. https://doi.org/10.1007/978-1-4419-6114-3_5

Madsen, C. K. (1987). Background music: competition for focus of attention. In C. Madsen & E Prickett (Eds.), *Applications of research in music behavior*. Tuscaloosa, AL: Univer. of Alabama Press. Pp. 315-325.

Mayfield C, Moss S. (1989). Effect of Music Tempo on Task Performance. *Psychological Reports*, *65*(3_suppl2):1283-1290. https://doi.org/10.2466/pr0.1989.65.3f.1283

Lambert, J & Cone, E. (2019). *How Robots Change the World.* Oxford Economics. https://www.oxfordeconomics.com/recent-releases/how-robots-change-the-world

Parente J. A. (1976). Music preference as a factor of music distraction. *Perceptual and motor skills*, *43-07 a=1*, 337–338.

Roberts, J.W. (1959). Sound approach to efficiency. *Personnel Journal*, 38, 6-8

Schäfer, T., Huron, D., Shanahan, D., & Sedlmeier, P. (2015). The sounds of safety: stress and danger in music perception. *Frontiers in psychology*, *6*, 1140. https://doi.org/10.3389/fpsyg.2015.01140

Schrelber, E. H. (1988). Influence of music on college students' achievement. *Perceptual and Motor Skills, 66*, 338

Sogin, D. W. (1988). Effects of Three Different Musical Styles of Background Music on Coding by College-Age Students. *Perceptual and Motor Skills, 67*(1), 275–280. https://doi.org/10.2466/pms.1988.67.1.275

Tafalla, R. J. (2007). Gender differences in cardiovascular reactivity and game performance related to sensory modality in violent video game play. *Journal of Applied Social Psychology*, *37*(9), 2008–2023. https://doi.org/10.1111/j.1559-1816.2007.00248.x

Wolf, R. H., & Weiner, F. F. (1972). Effects of four noise conditions on arithmetic performance. *Perceptual and motor skills*, *35*(3), 928–930. https://doi.org/10.2466/pms.1972.35.3.928

Yamada, M., Fujisawa, N., Komori, S. (2001). The effect of music on the performance and impression in a racing game. *Journal of Music Perception and Cognition, 7*, 65-76.