Noise, Not Personality, Predicts Cognitive Performance When Distracted

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Abstract

The purpose of this study was to investigate the relationship between personality types and background noise. Previous research has found mixed results on the effect of extarverion when experiencing background noise. We hypothesized that there would be differences in distraction type only and that there would be a difference in personality. Thirty Neighborhood Academy students were administered a personality test where they were scored on a 2-10 scale on the extraversion scale, then they were given a multiplication test in silence, cafe noise, and music conditions. We found that people did worse in noise than in silence, but personality types didn't have an effect. Our data suggest that the person should focus on background noise, but personality doesn't matter as much.

Introduction

Different personality types may respond differently to distractions like music or silence. According to Common Sense Media, 76% of people listen to music while doing homework, and it is likely these teens do not share identical personality traits (1). Some of them may be studying incorrectly. Research suggests that extroverted and introverted people perform differently on cognitive tests with different background noise (3). This study is important because some people could be studying incorrectly, and knowing this information could help people make better study choices. In our study, we gave students a personality test and then had them complete cognitive tasks in different conditions, such as silence, music, and noise.

When it comes to the Big Five 5 personality traits, different traits (Openness, Conscientiousness, Extraversion, Agreeableness, Neuroticism) all have different characteristics (1). Openness has to do with being creative with an adventurous mind. Conscientious people are more considerate of others' feelings and are aware of what they have to do to make sure it's done on time. Extraversion is people whose social battery increases with more social interactions, while the opposite would be called introversion, whose social battery is drained quickly. People who are more kind and affectionate and less comparative tend to have a more agreeable personality type called agreeableness, while neurotic people are constantly moody and emotionally unstable (1). These people tend to have mood swings and tend to have more anxious moments. Everyone has all 5 of the traits, they're on a continuous scale.

Eysenck's PEN model is another common way to describe personality (2). The PEN Model of personality is made up of three: **P**sychoticism- Normality, **E**xtraversion- Introversion, and **N**euroticism- Emotional. Psychoticism- Normality is considered “unstable people**"**. People like this have crime-like behavior and don't care about consequences, while on the opposite side, neurotic-emotional people are considered perfect. They stress over everything and only focus on the negative side. Extraversion- Introversion is about people's social battery. Extroverts gain energy by talking to people, while introverts are the complete opposite. Extroverts are believed to have higher levels of cortical arousal and require more stimulation to reach their baseline. These models of personality are important because they explain the different personalities people can have, so we can see how they perform on certain tasks when distracted by sounds, music, or shows.

Does background noise affect the performance of extroverts and introverts on creative and cognitive tasks? Chamorro-Premuzic and Swami thought that different types of background auditory stimuli (speech, noise, music, or silence) would have an impact on cognitive and creative task performance, and these effects would vary between introverts and extroverts (3). They had 77 high school students (60 female and 17 male). Everyone ranged from the ages 16-18. They were asked to complete different tasks. They were then asked to complete two cognitive and one creative problem-solving task: the Baddeley Reasoning Test, an SAT, and the Alternate-Uses Test. Personality was measured with the Neuroticism- Extraversion -Openness Five-Factor Inventory. There were no significant differences in the main or interactive effects of background noise and personality on the cognitive task. There was a difference in creative tests

when it came to extroverts doing better than introverts when listening to music. This makes sense because extroverts need more stimulation in the background to focus, and creative tasks require a lot of focus. This source is relevant to our study because it suggests there are differences in focus for introverts and extroverts, but it's unclear if this is always true with cognitive tasks, as the type of task might be very important.

Does the amount of noise going on affect a person's performance? Xi et al. thought that extroverted people would work better with loud noise in the background (4). They took 18 college students and made them take a series of concentration tests. There was also a survey to determine whether someone was an introvert or an extrovert. Then, each student was put into three different environments and had to complete 6 different assessments. They were tested with coffee shop noise, speech distraction, and silence. Their prediction was not supported. Their studies were inconclusive, and everyone scored similarly in all three conditions. We don't think they accounted for people who are both introverts and extroverts, or maybe the task wasn't hard enough, like reading, or maybe something besides extraversion would affect concentration.

Furnham and Bradley investigated the difference in performance with background music between extroverts and introverts (5). Some people can't focus without music. They hypothesized that extroverts would handle music better than introverts and that they would perform the same in silence. These 20 undergraduate students completed an Eysenck personality questionnaire to measure extraversion. Ten people with very high extroversion and 10 with low extroversion were used. They were given tasks which were memory and reading in the conditions of silence and pop music. They found out that their hypothesis was supported. Everyone did worse with music on the memory test. Introverts were worse with music than extroverts. Introverts with silence were better than both for the memory. For reading comprehension, the introvert did better on reading without music, while the extrovert did better with music. Overall, extroverts focus better on music compared to introverts. This supports Eysenck's theory that extroverts need more stimulation. This is important to our study because we want to see if the same thing happens here at TNA.

Furnham and Strbac studied how the different personality types (extroverts and introverts) focus on different background noises (6). They had two hypotheses: The type of distraction/background noise matters, and it depends on whether you're an introvert or extrovert. They had 76 sixth-form students. It was 33 males and 43 females who had to take a pre-test questionnaire and an EPQ (Eysenck Personality Questionnaire). They then took 3 different tests: a reading comprehension task, a prose recall task, and a mental arithmetic task. They completed this task in silence, music conditions, and noise conditions. In a reading comprehension task, introverts scored much lower than extroverts when there was background music or noise. While everyone's performance dropped with background noise and with music, extroverts did a bit better than introverts. In silence, there wasn't a significant difference between the two groups. This relates to my project because it supports my hypothesis that extroverts will do better with background distractions than introverts.

Overall, the research says that the different personality types differ in their performance on cognitive and creative tests with background noise, suggesting that extroverts perform better with background noise than introverts (3, 4, 5, 6). This study will contribute to the research going on and help people make better decisions when it comes to studying. So many people out there might be doing the wrong thing, like listening to music while studying or doing any task, not knowing that it could be potentially hurting them in the long run. In our study, they will take a personality test. Then, participants will take a cognitive test three different times in silence, with background music, and while talking to see how they will perform.

We hypothesize that the mean of test scores will differ significantly by distraction type. Research suggests that distractions like music or noise might interfere with concentration (5, 6). We hypothesize that the mean of test scores will differ significantly by personality and dissection type. This is because research suggests that extroverts would do better in background noise because they need more stimulation (2, 3).

Materials and Methods

A total of 30 high school students from the Neighborhood Academy participated in the study. All participants identified as African-American or Biracial, comprised of males 63% and females 36% from grades 9 and 12, and between the ages of 14 and 18.

The participants were given a survey known as the Big Five Inventory - 10 (BFI-10) to measure their extraversion (7). The survey consisted of 10 questions with two statements about extraversion. For example, extroversion is represented by the statement " I see myself as someone outgoing and sociable." At the end, the person would have a score out of ten.

People completed a memory and cognitive task. In the memory part, the person had to memorize a bunch of random numbers in 20 seconds, but that was for another research project. For the cognitive task, they had to complete a multiplication test (factors 1 -12) in 90 seconds, and then I would check to see how many questions they got right. The test consisted of 100 questions, so no one would be able to finish in the time that was given. The cognitive score would be the number of questions they got right. They tested in three different conditions: silence, music, and a cafe talking background. The background noise was found on YouTube and was selected because it was both realistic and felt distracting (https://www.youtube.com/watch?v=h2zkV-l_TbY&t=1969s). For the song, we used *Stay Ready* by Jhene Aiko. This song was picked because it's popular and people often listen to it.

Results

The purpose of our study was to test the different personality types in different background noises, and we did this by having people take a personality quiz and three multiplication quizzes in three different background distractions. A total of 30 people participated in the study; fifteen were extroverts, and fifteen were introverts. The average person got forty questions out of a hundred correct in two minutes.

Our first hypothesis was that there would be differences in distraction type only. A person's cognitive score is how many of questions a person got right. Introverts scored 2-5 on the Big Five Personality quiz, and extroverts scored 6-10. A one-way ANOVA for correlated samples found a difference between distraction type ($p=0.04$). A Tukey HSD post-hoc test said that noise ($M=40.7$) scored higher than silence ($M=34.1$, $p<0.05$). The music ($M=36.1$) condition was in between the two but was not different from the other 2 conditions.

Our second hypothesis was that there would be a difference in personality. A one-way ANOVA for correlated samples found no difference in music ($M=35.3$), noise ($M=39.8$), and silence ($M=33.1$) for extroverted participants ($p=0.05$). For introverted students, there was no difference in music ($M=36.9$), noise ($M=41.6$), and silence ($M=35.2$, $p=0.36$*).*

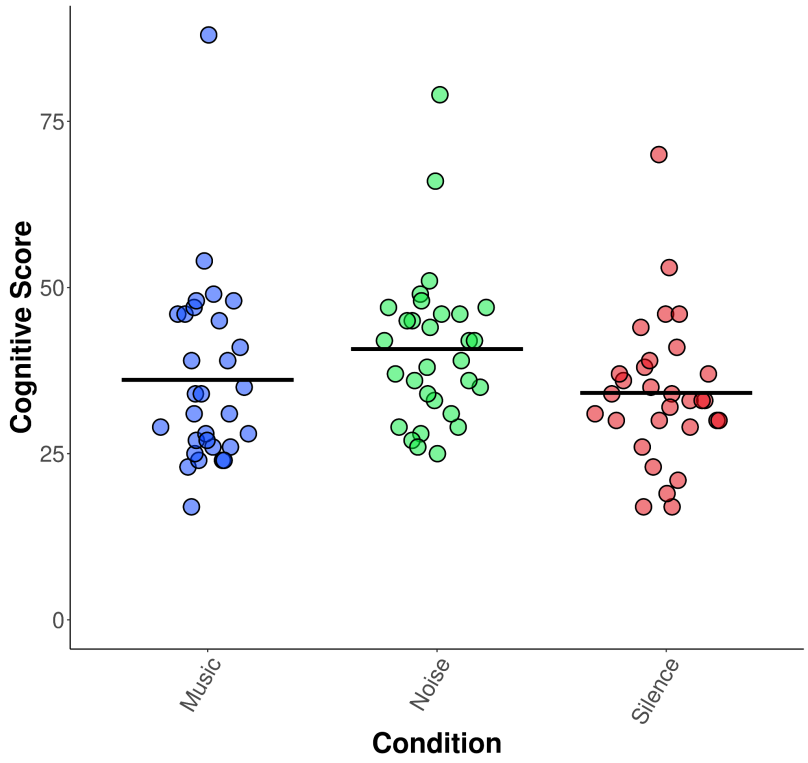

Figure 1: Participants scored higher with noise than they did with silence. *Thirty-five high school students did better in noise than they did in silence. 30 high schools had taken 3 cognitive tests, which were basic multiplication. A one-way ANOVA found a significant difference when it came to noise and silence (p=0.04).*

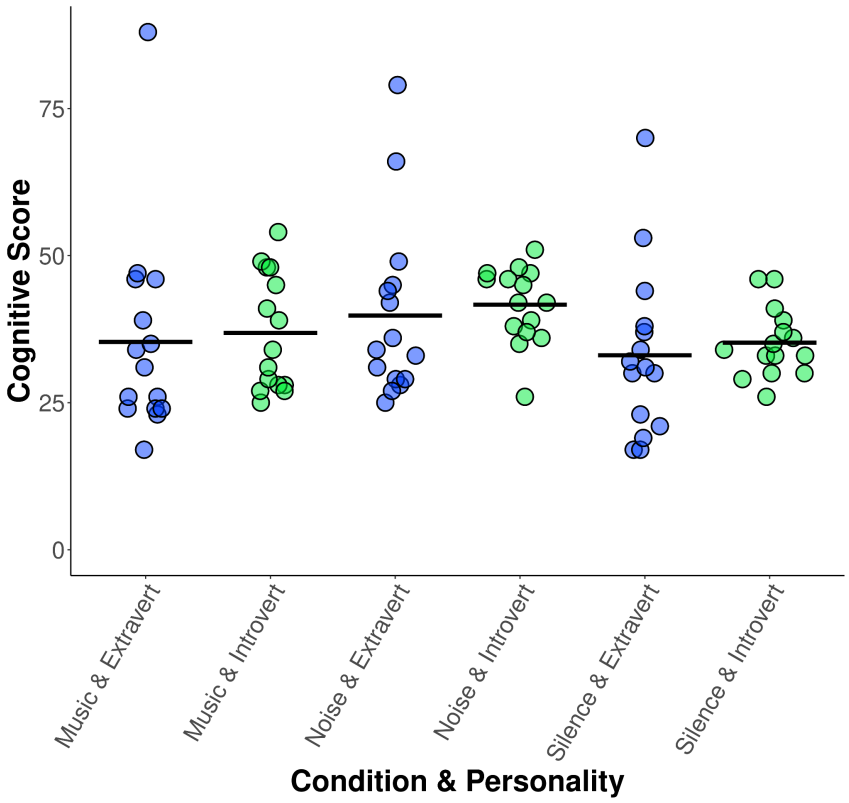

Figure 2: There was no significant difference for both extroverts and introverts. *Thirty high school students took the same cognitive test three times, once in music, once in cafe noise, and once in silence. A one-way ANOVA found no difference in music (M=35.3), noise (M=39.8), and silence (M=33.1) for extroverted and introverted students. There was no difference in music (m=36.9), noise (M=41.6), and silence (M=35.2). No differences were detected (p=0.36) for extroverts and (p=0.05) for introverts.*

Discussion

In the study, we looked at the different personality types in different background noises. Our hypothesis was that there would be differences in distraction type only. This was partially supported because only the noise background had a difference. Participants did better in noise than in silence, and music had no significant impact **(Figure 1)**. Our second hypothesis was that there would be a difference in personality. This was not supported because there was no significant difference between the personality types across the different distractions **(Figure 2)**.

Our results are partially consistent with other studies by Xi et al (4). Xi et al. found that everyone scored similarly in all three distraction conditions. We found that noise did better than silence, and music had no significant difference. These studies help strengthen the claim that different background noises have different effects on people's studying habits. These studies somewhat strengthen the claim that background noise is not necessarily distracting when

studying. Additionally, this suggests that noise helped some people focus because the task might have been easy or boring. Some noise is better for you, and it helps keep that part of your brain busy so it keeps the distraction from the outside world out (8).

We disagree with Frunham and Stabac. We found that personality types didn't matter when it came to the dictation test, and this is inconsistent with Frunham and Stabac, who found a difference in music and noise (6). The reason could be the difference in difficulty between the tasks. A recall test has you memorize a poem, whereas our test was a basic multiplication test. Eysenck's idea is that extroverted people need stimulation to stay focused while performing a task, but maybe personality type only matters in challenging situations. The difficulty of the task should be taken into account when considering personality. For example, if it was straightforward, then having music in the background wouldn't necessarily matter, while if it was a more complex task, then you might prefer silence if you're an introvert, while extroverts don't have a problem. This cognitive load of the task might predict how much personality matters. The Chamorro-Premuzic and Swami (3) study furthers the impact of difficulty in the task regarding personality type.

Our study has multiple limitations. Our first limitation is the music choice. The song we chose was a popular song that was trending at the time, but if we had let the people choose their song, then they may have been more comfortable with it and made a difference when it came to the music background. Another limitation was the cognitive task. The difficulty of the task might have been too easy. Having a harder task that requires you to think, and in return, might need more focus. A future improvement could be letting them pick the songs that they would normally listen to while studying. There is a chance that someone doesn't like the song that was chosen or was more focused on the song than the task at hand because it wasn't difficult.

According to our research, when it comes to noise, people tend to perform better than in silence or with music. While music may not be harmful, we aren't sure of the type of effects. Therefore, having background noise might help you focus more. Teachers and administrators should focus more on the kind of task and not the background noise because some types of noise may even be helpful.

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