The Effect of Extraversion on Working Memory

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Abstract

The purpose of this study was to investigate whether introverts or extroverts have a better working memory under distractions. Previous research suggested that personality might determine a person's memory while distracted by music or noise. We hypothesize that the average memory score would be different by the type of distractions; we also hypothesize that the average memory score would differ by the type of distractions and whether or not they are introverted or extroverted. A total of 30 participants, 15 extraverts and 15 introverts, were asked to do three memory tests: one with silence, one with noise, and one with music. We found that it doesn't matter if the person was an introvert or extrovert. Silence was the least distracting, which allowed and helped the participants remember more, while noise was distracting, and music had no effect. Our data suggests that students should be mindful of avoiding background noise to better remember essential information.

Introduction

Memory is essential in everyone's life. For example, in school, memory is crucial for studying for tests, remembering new information, and understanding new ideas. However, distractions like music or talking can make it more difficult to remember important information (1). According to Common Sense Media, 76 percent of teens listen to music while studying (2). Classroom noise, like talking, can be very loud and possibly distracting as well (3). If these distractions harm a person's memory, students can't learn as much as they could. Research suggests that certain personality traits might help lessen the damage distractions do to memory. For example, extraversion and openness, two of the Big Five personality traits, might improve the ability to remember when distracted by music or noise (4). In our study, we took random high school students and gave them a "personality test. Then, we tested their memory while there was noise, silence, and music in the background to see which personalities had a better memory when distracted

One way to talk about personality is the Big 5 Traits. The Big 5 traits are extraversion, agreeableness, neuroticism, conscientiousness, and openness (4). Extraversion is sociability, it's basically when an individual has a lot of energy to do many things and loves being around others, which makes them excited. Agreeableness is kindness, a trait that people have regarding being more cooperative with others, caring about others' feelings, regarding things they care about, and enjoying helping. Conscientiousness is thoughtfulness; this trait consists of being organized and structured, and loving to pay attention to details, having set plans, and things like that. Neuroticism is emotional stability; this trait experiencing mood swings and also experiencing stress. They also find it hard to bounce back after stressful events or hard times they are going through. Openness is creativity, this trait consists of being interested and curious to do many things, even when not want to or not even find an interest in something, they still do it. They are also eager to do many things. Some of these traits may impact the ability to remember information, especially while distracted.

Another way to talk about personality is the PEN model. The PEN model is a biological theory of personality developed by Eysenck (5). The P stands for Psychoticism-Normality, which means someone could be irresponsible or misbehave, or they can be normal. The E stands for Extraversion-Introversion, which means they experience lower arousal in their brain and therefore, crave being social and need external stimulation. The N stands for Neuroticism-Emotional Stability, which means that they have difficulty coping. These two models of personality are important because they tell us about different types of personality and why these might be better or worse on a memory task (5). We expect extroverts to do better because they have lower arousal.

Memory is more than recalling some vocabulary words for a test. It can be used to memorize a real scenario and things that happen in real life, like a violent crime 6). Areh and Umek studied a model that could be helpful in predicting the validity of eyewitness testimony. There were 98 participants who watched a video of a crime. A week later, these participants were given an Eysenck Personality test and a series of recall questions, which were graded on how much they remembered and how many facts they got right. As the study progressed, it was

clear that the Eysenck personality test was not able to predict how good they were at remembering a crime, but extroverted people did remember more. Neurotic people were also less accurate, possibly because they focused more on things going on with themselves and less on other people. In conclusion, in an actual real-life scenario, extroverts remembered more due to their high level of attention to their surroundings (6). This is important to our study because it doesn't matter whether it's a real situation or a fake. It can be concluded that extroverts may have a better memory than introverts.

The two personality traits of extraversion and openness may explain working memory or the ability to recall things when there are other distractions (1). Thorgusen studied personality concerning working memory. There were 371 participants. These participants were given an AOSpan test to measure their memory. They were given the personality quiz in the midst of that. An AOSpan task is when a person is given letters to memorize, and then they are distracted by a series of math questions, and then asked to recall the letters. As the studies continued, the final results came out that openness was associated with better working memory, while neuroticism was associated with worse memory, and extraversion was not related to memory. It is possible that neurotic people might focus on too many things and be overwhelmed,thus lessening their memory. However, open people might have better working memory because they may have better attentional control and can focus better (1). This is important to our study because we also look at personality, and we want to see if the same things happen.

Introverts and extroverts can be affected by exposure to noise (7). Moradi et al. investigated the effects of stress (noise) on the selective attention of introverted and extroverted university students. There were 28 participants in total, 14 males and 14 females; they were given the Eysenck personality questionnaire to determine their personality trait of extraversion. These participants were given a DUAF test before and during the noise exposure. A DUAF test measures selective attention, which is the ability to focus on a specific thing and not other distractions. As the study progressed, it was shown that introverts had reported more incorrect answers and extraverts reported more correct answers. The study indicated that the noise harms the selective attention of extrovert subjects less than introverts (7). This is important to our study because we are studying memory and distraction, and to remember something, one must specifically focus on the items being memorized and not on the distraction. Therefore, if extroverts pay attention better, they might remember better.

Introverts' and extroverts' memory can be challenged by movie dialogue, which is a type of noise distraction (8). Jacobson et al. recruited 48 participants and gave them surveys and quizzed them for 40 seconds on their memory. As the study continued, it was measured that both introverts and extroverts didn't do well while a movie was playing; instead, both did well when it was silent. It doesn't matter if you are an introvert oran extrovert, movie dialogue messes with one's memory.

Overall, the research says that memory is a great way to help learn, but noise and music can make it harder to do so, with personality traits such as extraversion influencing how music or noise might affect memory performance (3). This study contributes to the research on personality traits and memory due to its unique sample. High school students are interesting to

study because they deal with a lot of noise and music in their everyday lives. In our study, we measured if the high school students are introverts or extroverts. We then gave a memory test where they had to remember things while they were doing another research experiment with another student. They did this a total of 3 times, in silence, with noise from background conversations, and with music.

We hypothesize that the average memory score would be different by the type of distractions. This is because research says that music and noise are shown to be distractions for everyone (1,8). Second, we hypothesize that the average memory score would differ by the type of distractions and whether or not they are introverted or extroverted. This is because Eysenck says that extroverts need high arousal levels to focus, but they don't have that, so they tend to need outside stimulation to feel like themselves (4,6,7).

Materials and Methods

A total of high school students from The Neighborhood Academy participated in the study. All participants were African American males and females from grades 9-12th between the ages of 14-18. The participants were given a survey known as the Big Five Inventory-10 (9). Extraversion is measured on statement number one on how reserved you are and question six on how outgoing and sociable you are. The extraversion score came from reversing the number from question one and adding it to the number from question six, then they will get a total score out of 10 and giving a 2 with someone who is very introverted, while a 10 is very extraverted. Then, the scores on the memory quiz came from 10 numbers that they had to memorize, and their score came from how much they remembered. So, in this case, a score of 0 means that your memory is really bad, while a score of 10 means that your memory is really good.

First, we approached a person and asked if they wanted to participate and had them sign a consent statement to continue. Second, I had them answer the 10 questions on the paper to determine if they were introverted or extroverted. I then started the actual test and gave them 20 seconds to memorize 10 numbers. Then they were given a multiplication quiz that was a part of another researcher's project for 1 minute and 30 seconds, and then were asked what numbers they had remembered from the 10 numbers.

Differences in memory score using a one-way ANOVA test for correlated samples. The differences for introverted and extroverted people across the three distractions were measured with a two-way ANOVA. The individual differences were found using a Tukey post-hoc test. The abbreviation M is the mean, and SD is the standard deviation. All tests were calculated using vassarstats.net with a 0.05 significance threshold.

Results

The purpose of this project is to investigate whether introverts or extroverts have a better working memory under 3 different conditions: silence, music, and noise. Participants were given the Big Five Inventory-10 to measure their extraversion. Then, they studied 10 numbers for 20 seconds and were given an unrelated task to distract them after that. The participants were

asked to recall all of the numbers that they could. The 30 participants did this a total of 3 times, once with an R&B song, once with a coffee shop noise, and once with complete silence.

Our first hypothesis was that the average memory score would be different by the type of distractions. We had 30 people do a memory quiz with music, noise, and silence. The memory score is the score of the quantity of numbers that they remembered. A one-way ANOVA for correlated samples found a difference in memory scores ($F=6.04$, $p=0.0041$). A Tukey post hoc test found that participants remembered more in silence ($M=4.9$) than in noise ($M=3.5$, $p<0.05$). The music ($M=4.2$) condition was between noise and silence but was not different.

Our second hypothesis is that the average memory score would differ by the type of distractions and whether or not they are introverted or extroverted. We decided introverts would score a 5 and below on their questionnaire, while extroverts would score a 6 through 10. This gave us 15 introverts and 15 extroverts. A two-way ANOVA test for correlated samples did not find a difference in memory scores. ($F=0.15$, $p=0.86$). There were no differences in memory based on introversion or extraversion.

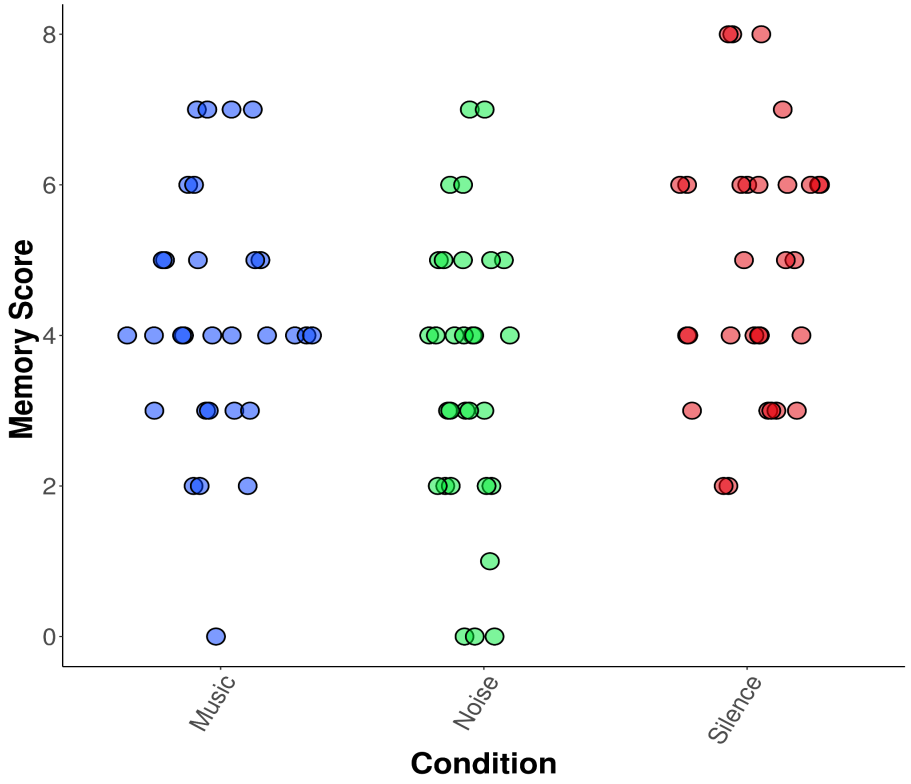

Figure 1. Participants have a better memory in silence compared to noise conditions*. A total of 30 students completed a memory task a total of three times: once with music, once with cafe noise, and once with silence. A one-way ANOVA for correlated samples found that the silence condition (M=4.9) results in significantly higher memory than the noise condition (M=3.5). No differences were detected with the music condition (F=6.04, p=0.004).*

	Music	Noise*	Silence*
Mean	4.2	3.5	4.9
F = 6.04, p=0.0041			

Table 1. *Mean memory scores by condition. Noise and Silence are significantly different.*

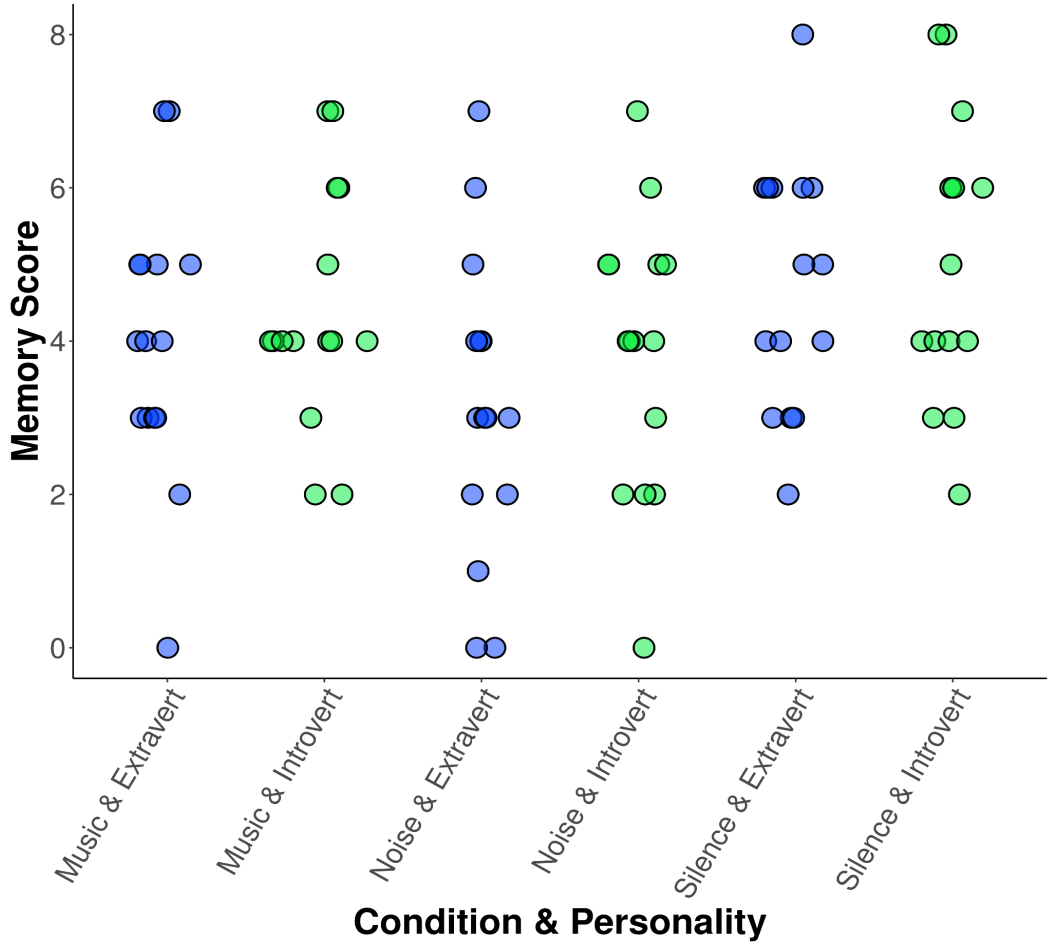

Figure 2. No differences in memory by personality type. *A total of 30 students completed a memory task a total of three times: once with music, once with cafe noise, and once in silence. A two-way ANOVA for correlated samples found no significant difference with silence (Extravert=4.7, Introvert=5.1), noise (Extravert=3.1, Introvert=3.9), and music (Extravert=4.0, Introvert=4.4). No other differences were detected (F=0.15, p=0.86).*

	Music	Noise	Silence
Extravert Mean	4.0	3.1	4.7
Introvert Mean	4.4	3.9	5.1
F=0.15, p=0.86			

Table 2. Mean memory score by condition and level of extraversion. *There were no differences in the behavior of extroverts and introverts.*

Discussion

In this study, we determined whether introverts or extroverts had a better memory under different distractions. Our first hypothesis was that the memory score would be affected by the type of distractions. This was supported because, in the silence condition, people remembered more than in the noise condition, but the music did not have an effect. (**Table 1, Figure 1).** Our second hypothesis was that memory scores would differ by the type of distractions and whether a person is an introvert or extrovert. This was not supported because there were no significant differences between introverts and extroverts between the three distractions (**Table 2, Figure 2).**

Our results are consistent with other studies by Thorgusen (4). Thorgusen found that openness was associated with better working memory, while neuroticism was associated with worse memory, and extraversion was not related to memory. Our study found that extraversion wasn't related to memory at all. These studies help reject the claim about the argument Eysenick made that personality is a main factor in working memory when distracted. Despite this idea being super interesting, maybe it didn't matter because maybe the task was too easy. It sounds like it would make sense because extroverted people like being distracted, and you would think they would do better with distractions. However, just memorizing numbers is probably so easy that we really didn't truly get the effect of being extraverted in memory. Maybe if the test had been remembering something that happened in a social event maybe they would be better, like in the study on remembering crime details where extroverts remembered more (6). Maybe the extraversion effect depends on the type of things you are remembering.

Our results are similar to those of Jacobson et al.. Jacobson found that it doesn't matter if you are an introvert or extrovert, movie dialogue messes with one's memory (7). Our study found that distractions mess with one's memory, and it didn't matter if you were an introvert or extrovert. These studies help strengthen the claim that distractions can cause one's memory to suffer. Because we both agree, we can say that noise is the enemy, and schools, parents, and students should focus on working in a quiet environment with no distractions.

Moradi found that introverts had better selective attention than extroverts (6). We thought that people with better selective attention would remember more. This did not happen. Introverts were able to remember similar amounts to extroverts while being distracted by noise. Therefore,

our place might not have been as noisy as Moradi's was. In conclusion, maybe some noises are correct.

Our study had some limitations. Our first limitation was that our noise and music weren't that much of a distraction. in the future, we should test them out before we start. Another limitation was that most of our people were around the same level; the introverts and extroverts were around the same numbers. Our suggestions would be to maybe get more introverted people with lower numbers and more extroverted people with higher numbers for a better result.

A future improvement would be not making our participants memorize numbers but instead memorize images or pictures. This may help emphasize differences in memory by personality. Also, finding if there is a difference, such as better or worse, between memorizing images and numbers could help researchers better understand whether introverted people have a worse or better memory than extroverted people.

According to our research, working in silence allows the best performance for both introverts and extroverts. However, music and noise gave about the same results. Therefore, it really didn't matter if you were an introvert or extrovert for music and noise. Teachers and administrators should focus on finding ways to improve working conditions by reducing noise so that all students can do their best in the classroom.

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