

DISTURBING IMAGES BISECTION TIMING TASK IN PSYCHOPATHY AND
IMPULSIVE TRAITS

by

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DEDICATION

I dedicate this work to my father, Hossein Talebi who passed away during my master's program. I love you baba, thank you for always being the light through darkness. Also, to my husband, Kashif Ali, you are my rock I could not have done this without you. Thank you to Ami and Abu for your unwavering support. To Melina and Darian, you are the reason life is sweet. Thanks to Rebeka for being such great support. Lastly, my mother, whose teaching on resilience and strength propels me forward even when giving up is always an option.

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ABSTRACT

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The proposed study is designed to explore the intersection of psychopathy and impulsivity with time perception. The focus of this research was to understand the impact of disturbing images on the psychopathic population compared to the norm. Reasoning being the limited research and findings connecting psychopathy and time perception. Participants completed a Dark Triad test and the Barratt Impulsiveness scale. They then underwent a bisection timing task that presented disturbing images following will be neutral images. Results from this experiment showed no correlation between the bisection point effect and coefficient of variation effect between neutral and negative images in relation to the psychopathy results of the Dark Triad test or Barratt Impulsiveness scale. There was a positive correlation between psychopathy and impulsiveness. Lastly, there was an effect where negative faces made participants less precise than neutral faces.

INTRODUCTION

Little is known of the link between psychopathy and temporal perception. Psychopathy includes traits of multiple symptoms, like impulsivity, shallow affect, narcissism, and 17 other factors according to the Hare Psychopathy Checklist-Revised (PCL-R). Understanding psychopathy is important due to its involvement in the legal system and mental health (Frick & Ray, 2015). The present study will focus on the impulsivity aspect of psychopathy using the Barratt Impulsiveness Scale (BIS) (Patton, Stanford, & Barratt, E. S. 1995) along with the Dark Triad Test (Jones & Paulhus, 2014) (See Appendix 1 and 2 for questionnaire's). There is limited research on the aspects of psychopathy with temporal perception. Due to the connection between emotions and time perception (Mella, Conty, & Pouthas, 2011), it is possible that perceived time is impacted for those, like psychopaths, who exhibit shallow affect (Marsh, Finger, Schechter, Jurkowitz, Reid, & Blair, 2010), when one feels little emotions about situations that would evoke emotion. Psychopaths are also proposed to be unmotivated to perform well without an actual reward (Kosson & Newman, 1986).

How does impulsiveness impact time perception? Furthermore, how does the Dark Triad (psychopathy) have an impact on time perception? Specifically, with associations to neutral versus disturbing facial expressions. How do non-malevolent traits

fare on these behavioral tests versus those who score high on the psychopathy portion of the Dark Triad or impulsivity? The Dark Triad test was created to ameliorate the obscure definition of psychopathy, Machiavellianism, and narcissism and look at these traits simultaneously (Jones & Paulhus, 2014). It was hypothesized that those who score high on the psychopathy portion of the Dark Triad test and impulsiveness will perceive the time of the negative images with no emotional impact on time perception. The current literature is limited in studies that involve how a psychopath perceives time.

The Dark Triad test exhibits three personality traits which include Machiavellianism, psychopathy, and narcissism. Psychopathy and antisocial behavior are negatively correlated with tasks that require perception of future events and how often they think about the future (Lilienfeld, Hess, & Rowland, 1996). This shows that psychopaths have a deficit in thinking about the future and thinking in the moment. One could imply that this is the cause for their inability to think about future consequences for their actions.

With regards to temporal perception, the dominant model is Scalar Expectancy Theory (SET), devised by John Gibbon (1977). This model explains behavioral aspects of time perception, most importantly the scalar property, wherein the variability of time estimates grows with longer intervals. Specifically, SET states that the perception of time is governed by an accumulator mechanism which is received pulses from an internal clock (Gibbon, 1977; Gibbon, Church, & Meck, 1984). This internal clock has a pacemaker that emits pulses that are accumulated while a timed stimuli is presented. It

has been shown that the length of intervals can be influenced by both the level of attention devoted to timing a stimulus, and the level of arousal elicited by that stimulus, both of which can increase perceived duration (Maricq, Roberts, & Church, 1981; Meck, 1983).

Studying how emotions are processed in psychopathy is essential for a better understanding of violent offenders (Casey, Rogers, Burns, & Yiend, 2013). Moreover, The importance of studying emotional behaviors and processes in psychopathy is important in creating treatment for violent offenders due to their negative impact on the population (Anderson & Kiehl, 2014). Furthermore, those who score highly on the Dark Triad have a propensity to be attracted to a lifestyle that is more immediate gratification seeking, which may result in more impulsive behaviors and further influence the estimation of time (Birkás, Matuz, & Csathó 2018). Similarly, previous work suggests Dark Triad traits are connected with a present oriented time perception (Birkás et al., 2018).

In a study done by Grondin, Laflamme, and Gontier (2014), participants were tested on a bisection task, involved participants looking at either facial expressions of disgust, or disgusting mutilation images and choosing whether they deemed the image to be long or short duration. Participants deemed the disgusting facial expressions and the mutilation images to be of longer duration. To explain these findings, the authors suggested that greater attention was placed upon the disgusted image, thus leading to a greater number of pulses accumulated with mutilation pictures. These results are

consistent with a study done by Gil and Droit-Volet (2012), where participants viewed disgusted or sad faces, disgusted/fearful faces, disgust-inducing images, or fearful images. They found that the duration of disgust-inducing images were perceived to be longer than fear-inducing images indicating that arousal additionally impacts the emotional effect of temporal perception (Gil & Droit, 2012). Participants of these studies did not have mental illness. Furthermore, emotional stimuli impacts a healthy individuals perception of time regardless to the type of image or facial expression (Droit-Volet, Bigand, Ramos, & Bueno, J., 2010)

Looking at a study connecting psychopathy and time perception, it was shown that prisoners diagnosed with psychopathy from a MMPI (Minnesota Multiphasic Personality Inventory) the psychopathic group had deviate scores (Hess, 1969, as cited in Lilienfeld et al., 1996). Researchers separated these into two categories, those who were primary psychopaths which results from mental deficit that cause fearlessness, manipulateness, and shallow affect or secondary psychopaths, which stems from environment which cause neurotic behavior, aggressiveness, and impulsive behavior (Gaizo & Falkenbach, 2008). Those who were primary psychopaths were unaware of their ability to complete tasks on time and tracking time was not an important part of their lives. They also scored longer on past and future timing observances. This was completed in a task that looked at five past occurrences in their life whether it was in the past or in the future. They had to list their age or coming age at the moment of that event. In the circle tracing task this group also were faster in drawing the circle in two instances. One

being tracing as accurately as possible and the other being accurate and slowly as possible.

In another study divided psychopaths into primary and neurotic psychopaths looking at their performance on partial reinforcement tasks, psychopaths did poorly compared to non-psychopaths (Painting, 1961). This task had participants choose a lever to press with negative or positive feedback. More quick and immediate feedback caused the psychopaths to perform better than slower feedback. In terms of psychopaths performance on a task that was related to paired associative memory, the psychopaths tended to have diminished performance when their response was delayed (Gullick, Sutker, & Adams, 1976). Gorenstein & Newman (1980) mention that psychopaths might have lower motivation compared to non-psychopaths that require them to complete tasks that concern attentiveness, which could impact results on performance task related studies.

In a study relating impulsivity to time perception, subjects underwent behavioral questionnaires on impulsivity and future time perception scale. Behaviorally, those individuals who under-reproduced temporal intervals also showed lower scores on the Zimbardo Time Perspective Inventory (ZTPI) future perspective subscale and higher scores on the BIS (Wittmann, Simmons, Flagan, Lane, Wackermann, & Paulus, 2011). Results on fMRI images showed that there was brain activity with peaks at nine second and eighteen second intervals in the right posterior insula. Areas that were activated in reproduction timing tasks connected to motor and the inferior frontal, the anterior insula,

inferior parietal cortex, and medial frontal cortex were further associated to scores on the BIS and ZTPI tests (Wittmann et al., 2011). With relation to psychopaths, these individuals are noted for having impairments in the prefrontal cortex that are related to symptom severity and psychopathy (Wittmann et al., 2011). A meta-analysis examined five structural and 15 functional neuroimaging studies. The studies that looked at structural areas showed that psychopaths have decreased prefrontal gray matter, decreased posterior hippocampus, and increased callosal white matter (Pridmore, Chambers, & McArthur, 2005). Pridmore and colleagues also found that in studies that focused on functional neuroimaging that there was lower functioning in the frontal lobe and temporal lobe. It was also shown in psychopaths the frontal and temporal lobes had dysfunction in certain learning tasks such as classical conditioning and response inhibition. Furthermore, there was dysfunction in tasks that required them to process emotions and pictures (Pridmore et al., 2005).

Impulsivity has deep connections to psychopathy. In the title, *Impulsivity: Theory, Assessment, and Treatment*, Hart and Dempster (1997) note that impulsivity is a fundamental trait in psychopathy. In addition, it is mentioned that it accounts for half of psychopathic expression. Which is an important reasoning behind including impulsivity in this study.

The literature shows that there is a missing link between psychopathy and impulsiveness connected to temporal perception which this study had hoped to fill in the

gap. There have been studies that focus on psychopathy and negative facial stimuli or temporal perception studies that focus on the negative facial stimuli on perceiving time.

METHOD

Participants

92 participants for this study, 34 male, 2 non-binary, aged 18-40, were acquired from George Mason University SONA systems and were compensated with course credit. We classified subjects as poor responders if their bisection point was either above or below the maximum tested duration in the stimulus set (300-920ms), which would indicate subjects only pressing a single button and thus not performing the task as required. 38 subjects were removed using this criterion, which left with 54 participants to be analyzed. Participants were right-handed and underwent a demographics questionnaire. Undergraduate students were participants for this study to explore this hypothesis. It has been shown that undergraduates do have lower incidents of antisocial behavior, but the benefit is that they are typically low on impact of addiction, depression, anxiety disorder, and related that influences disclosing established personality traits (Loranger, Lenzenweger, Gartner, Susman, Herzig, Zammit, & Young, 1991; Lilienfeld et al., 1996).

Materials

Participants were presented with four different male and four different female faces showing an angry and a neutral expression obtained from the FACES dataset (Ebner, Riediger, & Lindenberger, 2012); Images: 008_y_m_a_b, 008_y_m_n_b, 066_y_m_a_b, 06_y_m_n_b, 010_y_f_a_b, 010_y_f_n_b, 040_y_f_a_b, 040_y_f_n_b.

The Dark Triad test along with the Barratt Impulsiveness Scale were used. Participants were given the bisection timing task through a Pavlovia link (www.pavlovia.org). Also, the temporal bisection task experiment was produced in PsychoPy. Online consent form and demographics were given before behavioral tests.

Procedure

Participants were given the BIS and the Dark Triad. They were specifically scored on the psychopathy portion of the Dark Triad. The BIS is a test that evaluates the behavioral theory of impulsivity (BIS-11; Patton, Stanford, Barratt, 1995). The Short Dark Triad (SD3) test assesses traits stemming from Machiavellianism, psychopathy, and narcissism (Jones & Paulhus, 2014).

Trials were presented to participants with either a neutral or negative face; face stimuli were drawn from those used by our lab previously (Gladhill, Mioni, Wiener, 2022). Similar to a bisection timing task done by Gladhill and colleagues (2022), there were 112 trials. Each trial began with a fixation cross for 500ms, followed by the face stimulus for one of seven possible durations between 300 and 900ms (log-spaced). Subjects were required to classify the stimulus into “long” or “short” categories, compared to all previously seen durations; subjects responded as quickly but as accurately as possible.

Choice data were fit with a psychometric function, consisting of a cumulative Gumbel distribution, from which the bisection point and coefficient of variation were derived. The bisection point is the point on the curve where a subject is equally likely to

judge a stimulus as short or long, whereas the coefficient of variation is the slope of the curve divided by the bisection point. Statistical analysis was completed by using MATLAB software (statistics toolbox), RStudio, and JASP by comparing variables of psychopathy and impulsivity with the negative/neutral coefficient of variation and bisection point using paired-sample t-tests.

RESULTS

The bisection point, coefficient of variation, Dark Triad scores, and BIS scores were all calculated. The focus was on the psychopathy score of the Dark Triad test. The coefficient of variation comparing the negative versus the neutral faces was observed. The bisection point for the negative versus the neutral faces was also compared to see correlation. Lastly, the correlation for the bisection point and the coefficient of variation for the BIS and the Dark Triad were analyzed.

First, no bisection point effect was found between neutral and negative faces [$t(53)=-1.034$, $p=0.306$], contrary to previous findings (Figure 9). However, as a secondary effect, we observed a significant difference between the coefficient of variation for negative and neutral faces, with a larger value for negative [$t(53)=-2.349$, $p=0.023$] (Figure 8). The bisection point effect was not correlated with the BIS, $r=0.072$, $p=0.6$ (see Figure 3). Nor was the bisection point effect correlated with psychopathy, $r=-0.019$, $p=0.89$ (see Figure 5). The coefficient of variation effect was also not correlated with the BIS $r=-0.18$, $p=0.2$ (see Figure 4). Nor was the coefficient of variation effect correlated with the psychopathy portion of the Dark Triad test $r=-0.14$, $p=0.35$ (see Figure 6). The BIS and Dark Triad psychopathy scores were compared using Pearson's Correlation and were found to be positively correlated, $r=0.38$, $p<0.05$ (see Figure 7). Dark Triad psychopathy score and BIS scores of participants are represented in Figure 1

and Figure 2 respectively. This is in line with the notion of a fundamental relation between increased impulsivity and psychopathy (Hart & Dempster, 1997).

Table 1: Descriptive Statistics of Bisection Point, Coefficient of Variation, Barratt Impulsiveness Scale Score, and Dark Triad Psychopathy Scores

	BP Neutral	BP Negative	CV neutral	CV negative	Barratt	Dark Triad
Valid	54	54	54	54	54	54
Missing	0	0	0	0	0	0
Mean	0.592	0.600	0.214	0.247	63.019	2.226
Std. Deviation	0.114	0.119	0.098	0.139	10.078	0.447
Minimum	0.382	0.267	0.057	0.092	46.000	1.444
Maximum	0.847	0.890	0.691	0.987	89.000	3.111

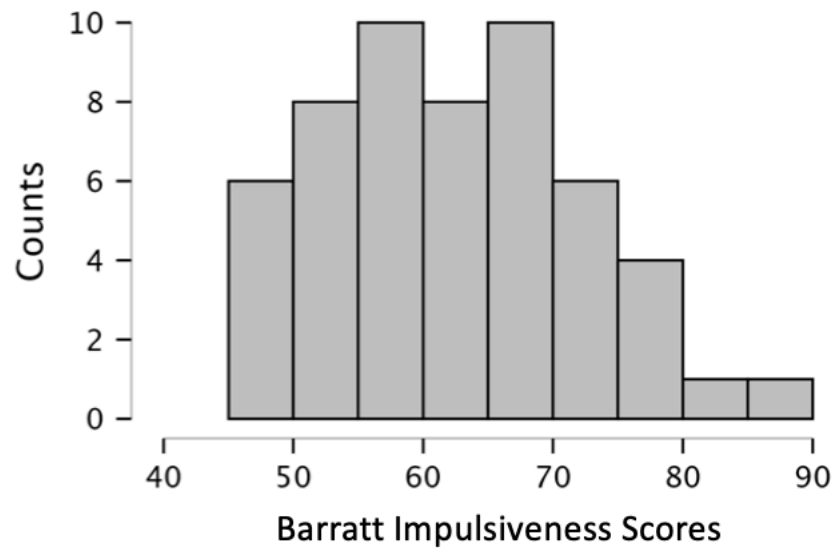


Figure 1: Histogram of Barratt Impulsiveness Scores

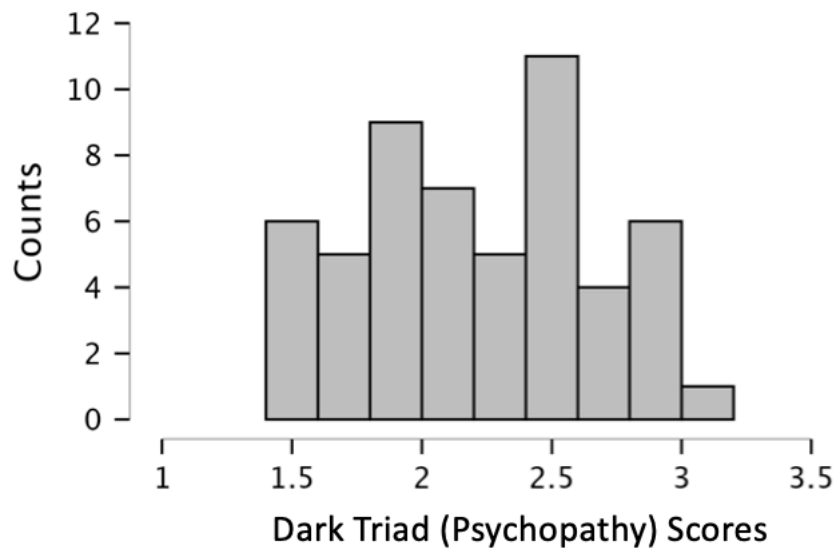


Figure 2: Histogram of Dark Triad (Psychopathy) Scores

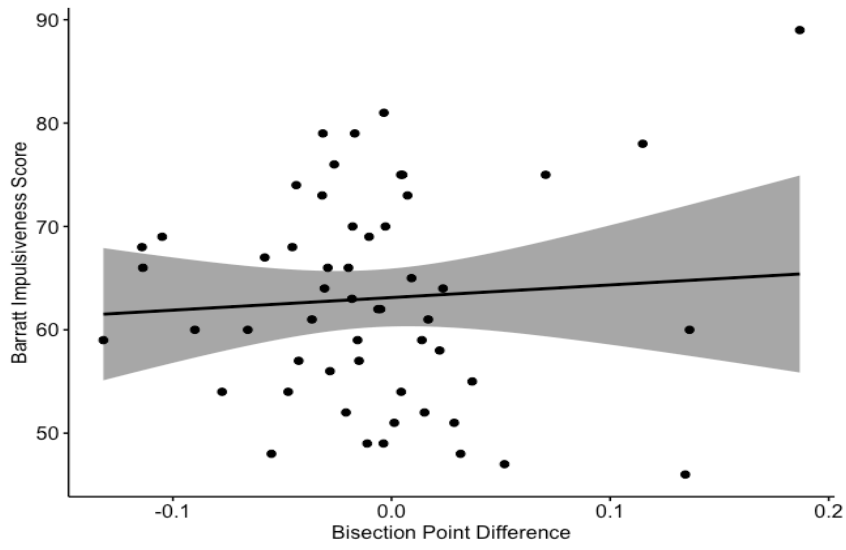


Figure 3: Correlation Between Participant Barratt Impulsiveness Score and Bisection Point Difference

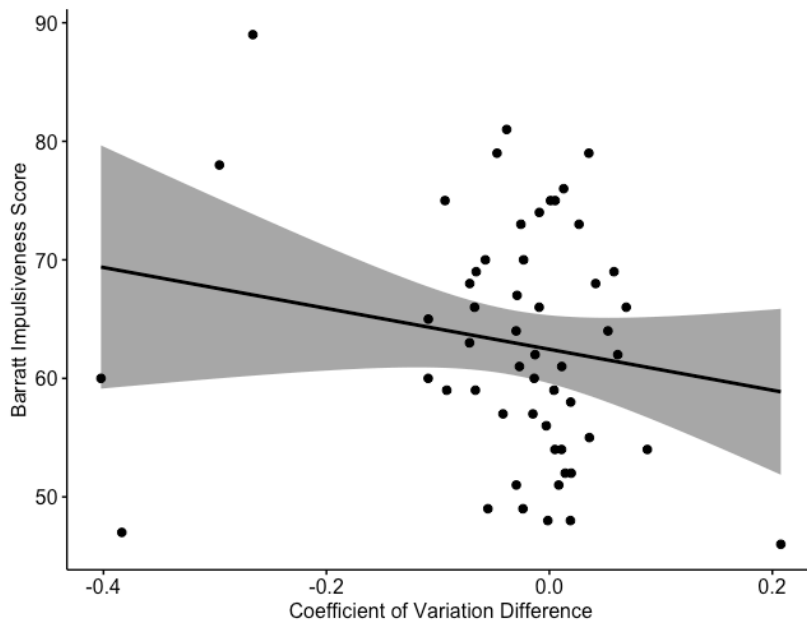


Figure 4: Correlation Between Participant Barratt Impulsiveness Score and Coefficient of Variation Difference

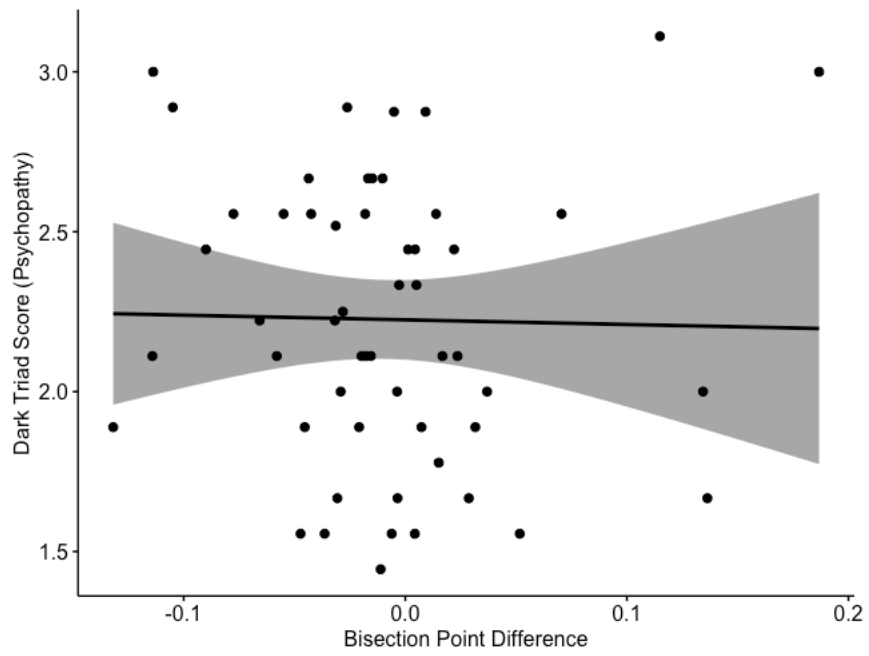


Figure 5: Correlation Between Participant Dark Triad Score (Psychopathy) and Bisection Point Difference

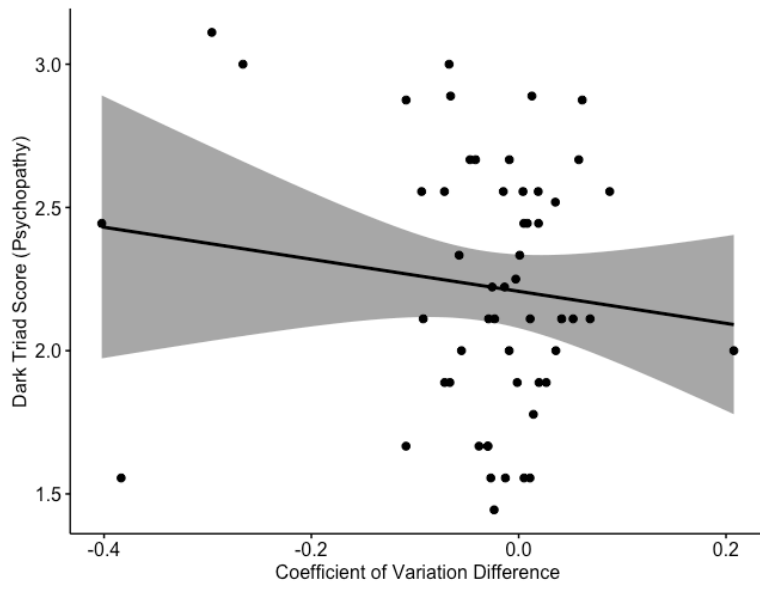


Figure 6: Correlation Between Participant Dark Triad Score (Psychopathy) and Coefficient of Variation Difference

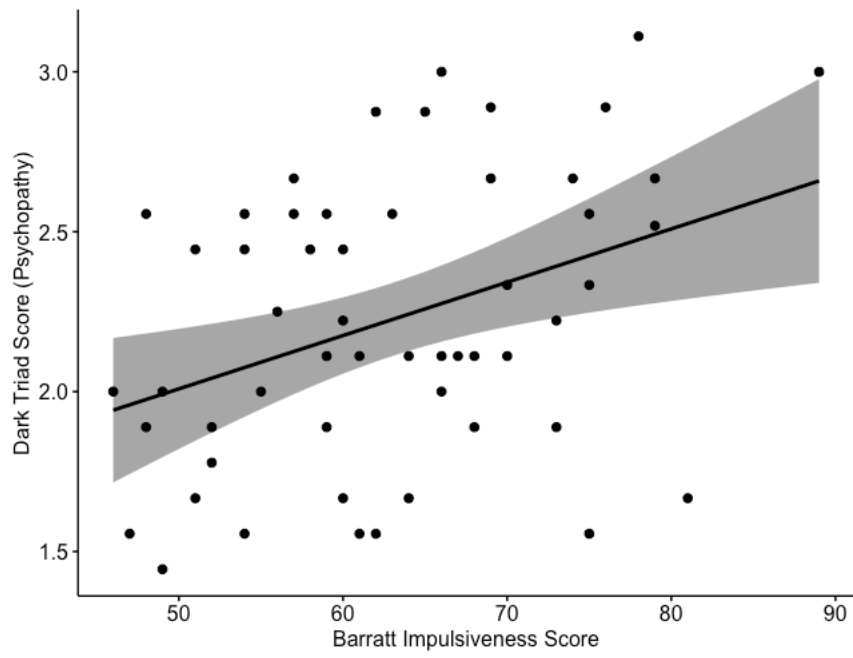


Figure 7: Correlation Between Participant Barratt Impulsiveness Score and Dark Triad Score (Psychopathy)

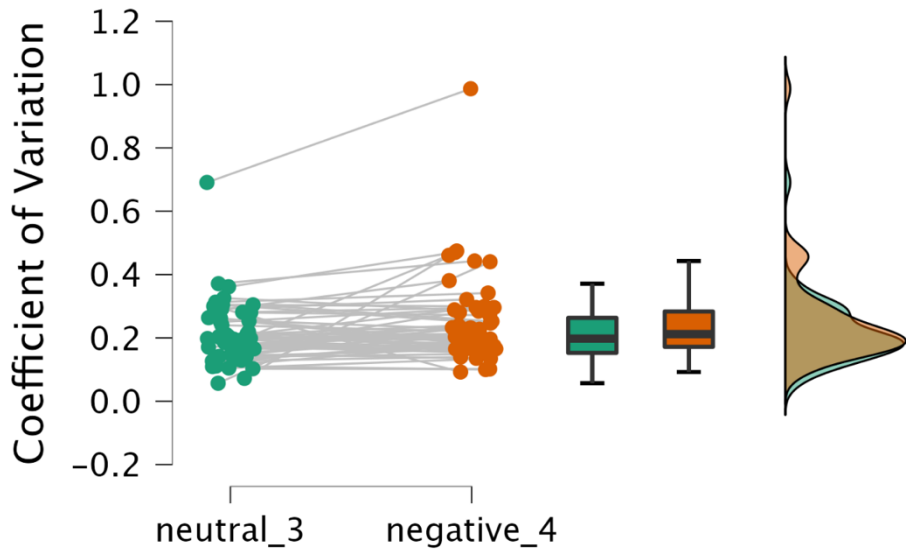


Figure 8: Difference Between the Coefficient of Variation Between Neutral and Negative Faces

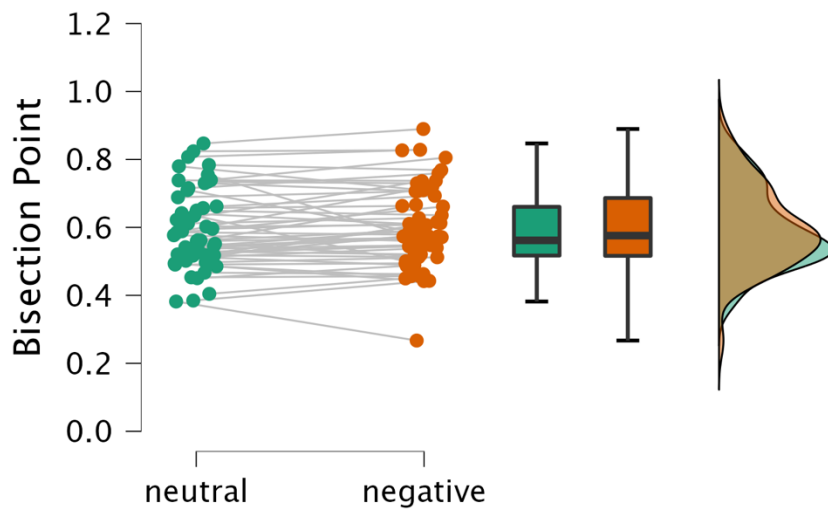


Figure 9: Difference Between the Bisection Point Between Neutral and Negative Faces

DISCUSSION

This study looked at the impact on time perception relating to impulsivity and psychopathy. Specifically, how being higher on psychopathic traits, thereby impulsive traits, will influence ones time perception of negative and neutral faces. Emotional stimulation has been shown to influence time perception and typically negative images result in overestimating time (Moreira, Azeredo, Barros, & Barbosa, 2022), which was what was expected in this study.

The results did not show any positive correlation between the emotional effect on time perception and psychopathy or impulsivity. Those who scored higher on psychopathy did not show any difference in judging the duration of emotional or non-emotional images. The expectation that those who are more impulsive and/or psychopathic will have no emotional impact did not have any significant results. This may be due to multiple factors relating to the participants and the experimental environment, or that there is no connection between psychopathy and temporal perception. Moreover, it could be that the limited research connecting psychopathy and time perception is context dependent, and so was not revealed using our particular methods. Moreira and colleagues (2022) suggest that, due to psychopaths having less ability to feel empathy, these subjects might have reduced reaction to images that elicit an emotional response.

One positive finding in this study showed that the coefficient of variation of time perception differed between negative and neutral images. That is, participants were less precise when viewing negative over neutral faces. Variable precision has been shown to be evident in schizophrenia patients also while processing timing information (Thoenes & Oberfeld, 2018). While the overall reason for this difference cannot be determined from our findings here, one possibility is that negative images lead to greater confusion when processing timing information.

A limitation to this study is mostly related to finding a small part of the population, psychopaths. It is difficult to not only find highly psychopathic individuals but to test them and ensure they will complete the study. Notably, among those subjects that were removed in our study for noncompliance, we did not observe higher scores on the psychopathic scale.

Other limitations include eliciting a reaction among the psychopathic population. Although the literature on time perception has positive findings with regards to impulsivity, there are limited findings for psychopathy. Due to the specific and distinct traits of psychopaths, it might be that these subjects have deficits in time perception but are able to overcome them in their responses (Gladhill et al., 2022). As a possible alternative, a large amount of of the U.S. prison population are considered to be psychopaths (Vaughn & DeLisi, 2008). Therefore, one future possibility would be to observe this population for possible timing changes related to their personality traits.

APPENDIX 1

Short Dark Triad (Paulhus & Jones, 2011)

- 1- Disagree Neither
- 2- Agree Strongly
- 3- Disagree nor Disagree
- 4- Agree
- 5- Agree strongly

Machiavellianism

- 1. It's not wise to tell your secrets.
- 2. I like to use clever manipulation to get my way.
- 3. Whatever it takes, you must get the important people on your side.
- 4. Avoid direct conflict with others because they may be useful in the future.
- 5. It's wise to keep track of information that you can use against people later.
- 6. You should wait for the right time to get back at people.
- 7. There are things you should hide from other people to preserve your reputation.

8. Make sure your plans benefit yourself, not others.
9. Most people can be manipulated.

Narcissism

1. People see me as a natural leader.
2. I hate being the center of attention. (R)
3. Many group activities tend to be dull without me.
4. I know that I am special because everyone keeps telling me so.
5. I like to get acquainted with important people.
6. I feel embarrassed if someone compliments me. (R)
7. I have been compared to famous people.
8. I am an average person. (R)
9. I insist on getting the respect I deserve.

Psychopathy

1. I like to get revenge on authorities.
2. I avoid dangerous situations. (R)
3. Payback needs to be quick and nasty.
4. People often say I'm out of control.
5. It's true that I can be mean to others.
6. People who mess with me always regret it.
7. I have never gotten into trouble with the law. (R)

8. I enjoy having sex with people I hardly know
9. I'll say anything to get what I want.

APPENDIX 2

Barratt Impulsiveness Scale- (Barratt, 1994)

- 1- Rarely/Never
 - 2- Occasionally
 - 3- Often
 - 4- Almost Always/Always
-
1. I plan tasks carefully.
 2. I do things without thinking.
 3. I make-up my mind quickly.
 4. I am happy-go-lucky.
 5. I don't "pay attention".
 6. I have "racing" thoughts.
 7. I plan trips well ahead of time.
 8. I am self controlled.
 9. I concentrate easily.
 10. I save regularly.
 11. I "squirm" at plays or lectures.
 12. I am a careful thinker.
 13. I plan for job security.
 14. I say things without thinking.

15. I like to think about complex problems.
16. I change jobs.
17. I act “on impulse”.
18. I get easily bored when solving thought problems.
19. I act on the spur of the moment.
20. I am a steady thinker.
21. I change residences.
22. I buy things on impulse.
23. I can only think about one thing at a time.
24. I change hobbies.
25. I spend or charge more than I earn.
26. I often have extraneous thoughts when thinking.
27. I am more interested in the present than the future.
28. I am restless at the theater or lectures.
29. I like puzzles.
30. I am future oriented.

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