

Examiner's Commentary

Psychopathology in general and antisocial personality specifically are fascinating areas for students. While many mistakenly choose to focus on serial killers and end up writing descriptive essays, there are alternatives to satisfy student interest in psychopathology. This essay on the role of the amygdala as a factor in psychopathology maintains a healthy balance between biological factors, such as the volume of the amygdala, and interpersonal functioning, specifically the interpretation of emotions. The research, which is mostly from scientific journals, is interesting to read and several of those sources are recent. The student includes detailed description of how technological tools are used to research the amygdala's function and structure. The evaluation of studies demonstrates critical thinking; strengths and limitations of the studies are indicated but along with that the student examines the underlying assumptions, pointing out that the complexity and intricacies of the brain and the amygdala limits the possibility of generalizing individual findings. In their reflections the student emphasizes the importance of structuring the essay to facilitate the selection of sources. From this it is clear that the student has developed analytical skills.

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The Amygdala as a Factor in Psychopathy

To what extent do abnormalities in the amygdala lead to psychopathy?

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Table of Contents

I.	Introduction _____	3
II.	Psychopathy and Antisocial Personality Disorder _____	6
III.	Amygdala and Reactivity to Emotional Facial Expressions ____	6
IV.	Blair's Amygdala Dysfunction Theory of Psychopathy _____	8
V.	Amygdala Volume and Psychopathy _____	14
VI.	Conclusion _____	17
VII.	References _____	19

INTRODUCTION

Through research conducted by Neumann and Hare (2008), it has been found that 1-2% of the general population possess traits which characterize them as 'psychopathic'. A psychopath can be defined as an individual which holds trait deficits that are usually found in people with antisocial personality disorder (APD), a DSM-5 diagnosis that is given to patients who constantly and extensively violate others' rights without empathy or guilt (APA, 2013). These include impairments in their identity, for example egocentrism, lack of empathy, an absence of intimacy, and a lack of self-direction, for example failure to follow the law or failure in setting goals based on personal satisfaction. Seven other maladaptive traits, which appear in the personality of a person who suffers from psychopathy, according to the DSM-5, are manipulateness, hostility due to antagonism, deceitful behaviour, callousness, irresponsibility and impulsivity, as well as risk-taking (Crego & Widiger, 2014). Callous-unemotional (CU) traits are repeatedly mentioned in several studies on psychopathy and the amygdala. These traits include lacking empathy and displaying insensitivity, and are characteristics of antisocial behaviour (Mann et al., 2017). Prediction of violence, more specifically reactive and instrumental aggression, has also been found to be a personality trait of psychopathy (Cornell et al., 1996), which creates a clear link, something that has been studied by many researchers.

Studies have indicated that a crucial area of the brain which is associated with the rise of psychopathic tendencies is the amygdala (Blair, 2013). The amygdala is a structure in the brain's limbic system which is an important part of emotional learning, emotional memory, and responses to emotion, such as fear, and aggression (Matthies et al., 2012). Due to the amygdala's emotional responses to fear, impairments in this structure are believed to be closely related to psychopathy and the traits of

unemotional behaviour (DeLisi et al., 2009). The brain structures of people with psychopathic tendencies tend to differ from the rest of the population in the amygdala, and therefore abnormalities in this structure lead to a lack of emotion (Moskowitz, 2011).

In a study conducted in 2009 by Yang et al., which aimed to discover global and regional abnormalities in the amygdala of people with psychopathic traits (Yang et al., 2009), twenty-seven individuals with psychopathy were recruited with a control group of thirty-two participants, which had equivalent characteristics in age, sex, and ethnicity. The sample was brought from high-risk communities, and a cross-section design was used, where the participants underwent structural magnetic resonance imaging scans. After the participant's amygdala volumes were examined in order to localize any deformations in the structures, the researchers found that individuals with psychopathic traits showed reductions in the bilateral volumes of their amygdala, when compared with the control group. In areas of their amygdala, such as the cortical and the central nuclei, surface deformations were found, while significant correlations were observed between the psychopathic scores of the participants and the reduced amygdala volumes. It was concluded that the findings of this study supported the hypothesis of deficits in the amygdala of individuals which have been diagnosed with psychopathy, while it suggested that abnormalities in the amygdala is a contributing factor to the symptoms of psychopathy (Yang et al., 2009).

The question which inevitably arises from such studies and findings is the extent to which abnormalities in the amygdala lead to psychopathy. This research paper will be arguing that several studies support the hypothesis that this complex structure in the brain is related to traits found in psychopathic behaviour, when there is an abnormality present. In order to support this hypothesis, one must primarily

investigate studies which are related to the topic, while analysing their content and findings. The scope of this investigation is to identify psychopathy by using the Diagnostic and Statistical Manual of Mental Disorders in order to outline the criteria of antisocial personality disorder, commonly referred to as 'APD', which is closely linked to psychopathy. Several studies, chosen from scientific journals, will be referred to in this essay, which will both support and contradict the hypothesis presented.

Research uses brain-imaging technologies such as MRI, fMRI, and PET scan techniques, in order to physically perceive structural differences that impact tissues that surround the brain. Changes in the thought processes of people with mental illnesses can originate from tissues inside the brain or ones which surround it, which can even cause a decline of motor skills (Foundations Recovery Network, 2018). Due to the MRI's ability to provide detailed images of organs and tissues, and the fMRI's capability to create three-dimensional images of brain structures, such technologies are continuously used in order to allow researchers to understand differences in the brain structures they want to focus on, and thus find cause-effect relationships between an abnormality in the brain and a specific behaviour.

Through the investigation of this topic, a wider understanding of the characteristics of a person who suffers with psychopathy will be developed, and also further comprehension of the causes of such mental abnormality. In addition, it is important to be aware of the causes in order to conclude with treatments, thus essentially alleviating symptoms of APD.

PSYCHOPATHY AND ANTISOCIAL PERSONALITY DISORDER

Studies which have investigated the relationship between the amygdala and psychopathy commonly examine the amygdala's effects on a person who suffers from

antisocial personality disorder, due to common symptoms such as the inability for control in their behaviour, and the lack of remorse. One of the criteria found in antisocial personality disorder are impairments in personality functioning, more specifically in interpersonal functioning. This includes a lack of empathy, which refers to an absence of concern for feelings, needs, or suffering of others, and a lack of remorse after violating another person's rights. It also refers to a lack of intimacy, including deceit and use of intimidation (American Psychiatric Association, 2012). All of the above refers to unemotional traits which are associated with antisocial behaviour, as well as psychopathy.

AMYGDALA AND REACTIVITY TO EMOTIONAL FACIAL EXPRESSIONS

A study which investigated the relationship between the reactivity of the amygdala to emotional facial expressions, associated to antisocial personality behaviour, more importantly on unemotional traits, was one conducted in 2015 by Hyde et al. (2016). A sample consisted of 167 twenty-year-old men, who came from a diverse range of different racial backgrounds and low-income families. To investigate the relationship between the amygdala and antisocial personality disorder, fMRI scans were used to observe the brain structure in depth. The participants were asked to complete a face processing task, where they were instructed to view three faces, and select one of the two faces presented at the bottom which were identical to a target face. Each of the face processing blocks contained six images, and each consisted of a different facial expression, such as fear, surprise, anger, and a neutral expression. The results showed that antisocial behaviour was negatively related to the reactivity of the amygdala to faces which conveyed fear. Although the hypothesis stated that antisocial behaviour would be related to a larger reactivity in the amygdala when the

person was exposed to fearful and angry faces, it was found that antisocial behaviour was actually linked with a lower reactivity in the amygdala when faced with these conditions. The researchers, using technology, compared the expressions of the participants when they were faced with fearful versus neutral facial expressions, and resulted that many dimensions of antisocial behaviour was negatively interrelated with reactivity in the centromedial region. Arrest record was positively related to the reactivity to angry faces which also presented fear. It was concluded that criminal and unemotional behaviour was in fact related to the amygdala, most importantly in African American men. These results convey the complexity of antisocial behaviour and psychopathic tendencies, and support that although there are several factors that are closely related to this causation, ratings of antisocial behaviour were negatively linked to amygdala reactivity, more distinctly when exposed to fearful expressions. The results suggest that different areas of the amygdala serve different purposes in relation to such psychopathic behaviour, but that altogether, they do in fact have a relationship with APD and psychopathy (Hyde et al. 2015).

This study had several strengths in its sample and methodology. Firstly, the sample is significantly representative due to the wide range of racial backgrounds, and the findings can therefore be generalized to the wider population, creating widespread results which can be used for further research. The use of an fMRI scanning process meant that there would be more efficient comparisons of the amygdala activity and its reaction to differential processing of emotional expressions, such as anger, and neutral expressions - acting as the control variable.

Although this study was a reliable representation of the effects of the amygdala due to several reasons mentioned above, there are certain limitations which may limit the extent to which the results can be used from further research and reference. As

many African Americans with low income are exposed to hardship and several stressors that come with it, chronic exposure to this setting through childhood may affect neural reactivity in the brain (Shaw & Shelleby, 2014). Therefore, by using a sample which consisted of men that came from low income families, the results may have not been representative of a wider population that were of a higher socioeconomic status. Also, the traits of antisocial personality disorder and psychopathy were self-reported, and there may have been participant bias in the study, while also containing a false diagnosis as it was self-presented.

BLAIR'S AMYGDALA DYSFUNCTION THEORY OF PSYCHOPATHY

There have been several theories which examine the relationship between psychopathy and brain structure, in order to interpret this psychological disorder and determine its etiology. One notable theory of psychopathy is derived by Blair in 2003. As stated by Blair, people who suffer from psychopathy respond with a reduced neural response when presented with a threatening stimulus, have low aversive conditioning, which is the lack of an unpleasant disciplinary punishment to oneself when acting in a distressing way, poor emotional responses while awaiting punishment, lack of emotional responses while imagining events that are deemed threatening, and also respond to aversive stimuli with a deficiency in their startle reflex. Furthermore, in his theory, Blair explained that individuals that have a general dysfunction in their amygdala also obtain consistent impairments which primarily include the ones mentioned above. The amygdala is seen to be responsible for creating emotional responses to fearful situations or ones that call for distress, while also allowing an individual to distinguish between what is right and wrong. As people with psychopathic

tendencies have been found to be impaired in both of these functions (Blair, 2007), it can be understood that there appears to be a direct link between this structure found in the brain and psychopathy. This is because both individuals with impairments in their amygdala and ones with psychopathic personalities are unable to understand the sorrow and fear of others, and are not able to easily distinguish between right and wrong.

In order to support this theory, Blair et al. had previously conducted an experiment examining whether there were neural responses by the amygdala structure when the individual was presented with angry or sad facial expressions (Blair et al., 1999). Thirteen psychologically healthy subjects, with no history of psychiatric disorders, which were men with a mean age of twenty-five years, volunteered to take part in this research. PET scans were used on the sample while they carried out a task, which included images of people's faces that conveyed several degrees of anger, frustration, and sadness. The researchers concluded that there was more enhanced activity in the left part of the amygdala, through gradually enhancing the intensity of the sad facial expressions. This provided the researchers with evidence showing that the amygdala plays an important role in the interpretations of emotion conveyed by another. It supports Blair's theory as it provides substantial evidence showing that people who have psychopathic traits have a reduced neural response when presented with threatening stimuli, and also lack emotional responses, thus conveying the limited startle reflexes in distressful or fearful circumstances. It is important to note that as this experiment involved numerous cognitive processes, such as the recognition of facial

expressions and the difference between sexes, there may be a confounding variable due to the possible lack of these automatic activities that would normally occur.

In Blair's amygdala dysfunction theory of psychopathy, the researcher explained that during the empathy of another, an individual's amygdala response to the emotions conveyed by the other person, is of great importance in socialization. In order to develop moral socialization, one must be able associate offence with the pain emitted to the person as punishment. Individuals who suffer from psychopathy cannot usually create these links, and can easily be led to follow antisocial behavioral alternatives, such as violence (Blair, 2006).

Supporting this claim, Blair et al. conducted an experiment which looked at impairments in the process of understanding expressions which included fear and sadness, in children who had previously shown psychopathic tendencies (Blair et al., 2001). The researchers hypothesized that one of the most fundamental skills for interaction between individuals is the processing and understanding of emotional physical expressions. In contrast, the inability to interpret sad or fearful expressions, is associated with the progression of psychopathy. The study aimed to explore whether children with psychopathic traits were able to recognize and respond to facial expressions, or whether they would respond with insensitivity (Blair, 2001). The sample consisted young boys who suffered from psychopathy and a control group. The psychopathic tendencies group was formed by selecting 20 children with a PSD score more than 28, and the control group consisted of 31 children which scored below 20.

Table I. Participant Characteristics

Group	PSD	C/U	I/CP	Age	IQ
Children with psychopathic tendencies (<i>N</i> = 20)	31.55** (2.57) [28–37]	8.53** (1.23) [6.5–11]	16.03** (2.07) [10.5–18]	12.93 (2.54) [9–17 years]	90.30 (12.01) [68–117]
Comparison group (<i>N</i> = 31)	7.58 (4.41) [0–17]	2.02 (1.51) [0–6]	4.42 (2.85) [0–10]	12.84 (1.64) [10–16 years]	92.27 (15.98) [68–133]

Note. PSD = Psychopathy Screening Device; C/U = the callous and unemotional component of psychopathy (e.g., a lack of guilt); I/CP = the impulsive and conduct problems component of psychopathy (e.g., engaging in crime); IQ = intelligence quotient; *N* = number of participants. Standard deviations in () brackets, ranges in [] brackets.

***p* < .001.

Blair, R. J. R. , Colledge E., Murray L.,and Mitchell D. G. V. (2001) A Selective Impairment in the Processing of Sad and Fearful Expressions in Children with Psychopathic Tendencies, *Journal of Abnormal Child Psychology*, Vol. 29, No. 6, pg.491-498

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last accessed on 6/11/18

They were shown a standardized collection of facial expressions such as happiness, surprise, disgust, anger, fear, and sadness. The participants of both the control group and the sample of children with psychopathic tendencies were asked to recognize the expressions that were presented to them, and they watched while the emotions developed in growing intensity through consecutive images. They were told that the expressions that they saw on the computer screen would initially be neutral, while gradually forming one of the six expressions listed on a paper. The results showed that the children with psychopathic propensities needed significantly more time on average, and more stages of growing intensity of the images, to correctly identify the expressions with conveyed sadness, while in many cases were notably more likely to create wrong interpretations of the fearful expressions, than the control group. Four of the boys with psychopathic traits (20%) were unsuccessful in responding correctly to the expressions conveying fear, while one out of five of these children were not

successful in giving any correct answers to the expressions of sadness. Twelve percent of the children in the control group also unsuccessfully responded in these tasks. These results signified that children with psychopathic tendencies indeed presented impairments in their amygdala, which is responsible for emotional responses and the ability to distinguish between fear or sadness and happiness, therefore lacking in the ability to have empathy towards another individual. They also noticed that there was an important difference between the incorrect answers given by the psychopathic group in relation to the control group. (Blair et al., 2001) In reference to Blair's theory, this study supports that individuals with psychopathic tendencies are limited in their ability to respond emotionally, and as the amygdala is responsible for creating these responses, an abnormality in this structure can suggest a relationship between them. This study allowed for a better understanding that impairments in the amygdala were clearly linked to psychopathic traits. It suggested that the amygdala was crucial for linking another individual's sadness with the activity or reason that caused it, and therefore, as these children with psychopathic tendencies were more prone to being insensitive to sad and fearful expressions, it displayed a lack of activity in their amygdala (Blair et al., 2001).

This study had several strengths which supports the reliability of its results. Initially, several variables such as the children's IQ and their age were not notably different in order, which allowed for a better comparison between the two groups. The similar age of the boys also allowed for a more reliable comparison due to the similar brain development that they had, and they could similarly cope with understanding facial expressions.

In contrast, there are several limitations which must be noted, as they may affect the reliability of the results obtained. Firstly, expressions which present fear are significantly more difficult to identify than other facial expressions (Ekman & Friesen, 1976), thus creating a large number of unsuccessful responses from both the sample and the comparison group, when trying to recognize them. This does not allow for differences between the groups that can be used for comparison. Furthermore, adults have been found to respond more successfully in these tasks, and adult individuals with psychopathic tendencies do not have significant impairments in their ability to identify sad expressions on tasks like this one. This may suggest that the results obtained may not be generalizable to individuals with psychopathy at different ages, while also expressing that the results may not be their disorders, but due to not being fully developed at that age.

AMYGDALA VOLUME AND PSYCHOPATHY

The amygdala is important in processing emotion, which in turn is significant in recognizing aggression. Abnormalities in this brain structure have been recognized as playing an important role in interpreting aggressive actions between individuals that are suffering from psychopathy. It has been found in several studies that psychopathy can be linked to limited amygdala reactivity when an individual with this disorder is presented with an emotional stimulus. (Pardini et al., 2014)

Several researchers that study the relationship between psychopathy and the amygdala create longitudinal studies, tracking the activity of children throughout their development into adulthood. This allows the researchers to form reliable results and

follow an individual for a long period of time, noting their development, and if something that occurred when the participants were younger lead or affected their actions as adults.

Pardini et al. carried out a longitudinal study from 1987 to 2014, which was aimed at investigating whether amygdala volumes played a role in childhood aggression, psychopathic traits in early childhood, and violence as an adult (Pardini et al., 2014). This study was the first to connect aggression and psychopathy to the amygdala volumes, while being assessed over a 22-year period, tracking the participants throughout their childhood and into adulthood. The participants that were recruited were 56 men. The boys were a small sample from a previous study, and they consisted of first graders. Hundreds of individuals were recruited by an initial screening that allowed the researchers to measure their antisocial behaviours by speaking to important individuals in their lives. Participants who scored in the higher percentage of this, as well as randomly chosen boys from the rest, were then chosen to participate in the Pardini et al. study (Pardini et al., 2014). For four years, assessments took place regularly, the first one occurring once the participants reached 7 years, and then happening every six months. A further two assessments occurred when the participants were 25 and 29 years old.

The volume of the amygdala of the participants was measured using an fMRI segmentation tool. Models were created of the participant's brains, and segmented in order to allow the researchers to study each part individually (Pardini et al., 2014). The volumes of the left and right amygdala were taken out and were analyzed. Tests were done to identify the relationship between the amygdala volumes and psychopathic

features/aggression, measured from childhood and during each participant's adolescence. The analysis further examined whether amygdala volumes were related to the psychopathic traits and acts of violence that were evaluated at the follow up assessments (Pardini et al., 2014).

The results of this study showed that the participants who had lower amygdala volumes showed higher levels of aggressive behavior and psychopathic features from their childhood to their adulthood. In addition, lower volumes in the amygdala was seen to be related with aggression and psychopathic traits at one of the follow-up assessments. There was a significant relationship between lower amygdala volumes and psychopathic traits which had appeared in the participants' earlier years.

This study was the first to show the relationship between men with lower amygdala volume and their significant risk for displaying psychopathic traits in the near future, even if these features have been previously controlled. From this study, the researchers were able to obtain the association of a low amygdala volume and impulsivity, a trait found in people who suffer with psychopathy. The researchers were able to convey that lower amygdala volumes in the brains of men led them to aggressive behavior and exhibiting psychopathic traits in their childhood and early adulthood.

Several factors must be taken into consideration when exploring this study. Firstly, it is important to note that the study focused solely on the effects of the amygdala volume of psychopathic traits and aggression, and did not take into consideration other brain regions whose structural abnormalities may as well be associated with the phenotypes projected by the participants and ones which are

effects of psychopathy. Furthermore, the researchers found that lower volumes in the lower right amygdala was not seen to be significant enough to determine a relationship between the latter and psychopathy, showing that not all components may be related to such behaviour (Pardini et al., 2014). In contrast, the longitudinal study allowed the researchers to observe the participants through several assessments during a long period of time, which in addition has seen to be the most crucial for psychopathic trait development. This created more reliable results due to the in depth analysis that occurred.

CONCLUSION

The causes of psychopathy, and links between psychopathic traits and brain abnormalities have been continuously studied by many researchers. This is because a mental disorder such as psychopathy or APD cannot contain a single cause-and-effect relationship, because of its complexities, as well as the intricacy of brain structures such as the amygdala. Through several studies, though, the amygdala has been found to play a significant role in causing traits found in psychopathy or APD, such as a lack of emotional responses, decreased ability to empathize with another, and inability to create intimate relationships. There has appeared to be a clear link between the latter brain structure and psychopathic behaviour, through studies conducted on the effects of the amygdala's volume, as well as reduced amygdala responses to situations where people are faced with fearful expressions.

Lower amygdala volumes are found in people that contain psychopathic traits. The amygdala has been found to be linked with aggressive acts and limited amygdala reactivity when exposed to situations that require an emotional response. The studies

conducted by Yang et al., 2009, and Pardini et al., 2014, using brain scans, both concluded that lower volumes in the amygdala do in fact play an important role in the introduction of such traits.

An important finding that is believed to be linked to psychopathy, is a lack in emotional responses when exposed to fearful expressions and situations that require empathy. The study conducted by Blair et al., 2001, supported his theory that people with psychopathy respond with reduced neural activity when exposed with threatening situations, or ones of fear and sadness. Furthermore, the study conducted by Hyde et al., 2015, further supported that people with psychopathy lack an emotional response when presented with expressions that convey fear or pain.

It can be concluded that the abnormalities in the amygdala play a significant role in leading to psychopathy and its traits. Although mental disorders are not easily placed into categories and specific guidelines of their causes, and psychopathy is an importantly complex disorder that is brought by more than one factor, research in this topic provides sufficient evidence to convey the relationship that the amygdala has with psychopathic traits.

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Extended essay - Reflections on planning and progress form

Candidate: This form is to be completed by the candidate during the course and completion of their EE. This document records reflections on your planning and progress, and the nature of your discussions with your supervisor. You must undertake three formal reflection sessions with your supervisor: The first formal reflection session should focus on your initial ideas and how you plan to undertake your research; the interim reflection session is once a significant amount of your research has been completed, and the final session will be in the form of a viva voce once you have completed and handed in your EE. This document acts as a record in supporting the authenticity of your work. The three reflections combined must amount to no more than 500 words.

The completion of this form is a mandatory requirement of the EE for first assessment May 2018. It must be submitted together with the completed EE for assessment under Criterion E.

Supervisor: You must have three reflection sessions with each candidate, one early on in the process, an interim meeting and then the final viva voce. Other check-in sessions are permitted but do not need to be recorded on this sheet. After each reflection session candidates must record their reflections and as the supervisor you must sign and date this form.

First reflection session

Candidate comments:

I chose this research question due to my curiosity of whether one can develop criminal traits throughout their life. As I want to study law, this process will give me a wider perspective of the reasons behind criminal behaviour. The biggest challenge I have faced is grouping the information on the topic in order to improve my understanding. I believe that creating a plan and separating information by topic (studies, information, theories) will allow me to overcome this challenge by giving me further clarity of what must be included. I need to decide whether I want to specify this essay on brain impairments, or more specifically the amygdala, as both are eminently interesting. I believe that research in this field is significantly based on case studies, as brain impairments are unique, but generalization may occur through comparison.

Date: 4/3/2018

Interim reflection

Candidate comments:

Through my research on criminal behavior and its link to impairments in the amygdala, I found that numerous studies established relationships between brain impairments in the amygdala and psychopathy. I decided to create a more succinct research question on this topic, due to my interest of this mental abnormality. What surprised me most is that there are several traits that define psychopathy, but there is not a specific guideline for diagnosis. The DSM-5 does not have psychopathy included as its own disorder, but rather uses APD in order to reflect psychopathic traits, as APD is an umbrella term for such disorders. I avoided confusion of interlinking these disorders by clearly stating the traits that appear in both and are used for diagnosis. I met difficulties in locating studies that specifically refer to this relationship and are backed up with sufficient evidence, something I am planning to overcome through linking the traits present in each to psychopathic traits of violence and lack of empathy. Having studied biological psychology, I realized that I possess an understanding of the brain and its link to behavior.

Date: 20/6/2018

Final reflection - Viva voce

Candidate comments:

Having completed my extended essay, I have recognized my development of wider knowledge on this fascinating field of psychology, something that occurred through my research. What surprised me most was the lack of distinct traits that forms each diagnosis, and the overlap in the symptoms of disorders due to similarities, (such as psychopathy and APD), allowing researchers to study them simultaneously. I faced difficulties in forming a clear structure and selecting studies that relate most to the topic. I overcame this by including a theory and basing the information around it, while creating a succinct plan. Due to the wildfires that occurred in the summer, I was not able to take the time I hoped for in completing my EE, but because of the skills of time management and my interest on this topic, I managed to do so to the best of my abilities. It is important to recognize that there are numerous factors that affect someone's mental health, and there cannot be a clear answer to this research question due to the complexities of biological and mental factors.

499 words

Date: 7/1/2019