

Challenge Final Report Submission Information

Team ID-

MELHS42

School Name-

Melrose High school

Project's Area of Science-

Psychology/ Behavioral Studies

Computer language(s) used in your project

Net Logo

Team members grade levels in school (comma separated)-

Senior

Team member's email addresses (comma separated)

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PTSD in Babies Brains

NM Supercomputing Challenge

Final Report

April 2, 2018

Team Number: MELHS42

Melrose High School

Team Members:

Andrea Martin

Teachers:

Alan Daugherty

Project Mentor:

Alan Daugherty

Executive Summary

PTSD is a mental disorder that is widely known for its adverse effects on the minds of those who have seen combat. However, not many understand that PTSD can occur in various forms and is very susceptible to occur in the minds of infants and young children. Events such as neglect, abuse, and shaking can cause intense damage on developing minds. There are about 5.5 million children involved in child protective services in the U.S. each year. Of these cases, 65% are neglect, 18% are physical abuse, 10% are sexual abuse, and 7% are psychological abuse. Up to 15% of girls and 6% of boys will develop PTSD. In doing this project, I am attempting to show how each event affects different areas of the brain and how children can obtain PTSD when they don't even remember the trauma. I also address different medications and how they affect different areas of the brain. These include; chemical, herbal, and therapeutic. With a personal understanding of PTSD and anxiety on the brain and a motivation to bring awareness to the sensitivity of infants developing minds, this project is made to be antagonistic.

Problem

The only way for me to describe the motivation I had for addressing this issue, is to tell my story. When I was in my first 6 weeks of life, I faced serious neglect and starvation. I went into the hospital with major weight loss and labeled as a "failure to thrive." Now, 17 years later, I suffer from both physical and mental issues in relation to that neglect. As the symptoms of mental illness are becoming much more prominent in my life, I am becoming interested in how PTSD could still be present 17 years after facing a trauma that I don't remember. PTSD is often pushed to the side as something only soldiers face. It is assumed only to appear with flashbacks and fear facing guns on the battlefield. Now I am attempting to break these stereotypical

assumptions and bring awareness to the severity of the issue in our youth all over our country. My goal is to inspire minds towards investigating more time towards the issue of infant PTSD.

Method

This project is predominately research-based. The majority of my findings are gathered from various statistics and brain scans. By gathering the information, I am able to collect it together into my programming to address more directly, the areas of the brain affected by each event. Although the major portions are more well known, there are many smaller portions which contribute to reacting to and maintaining memories from a traumatic event. Portions such as the amygdala, hippocampus, hypothalamus, cerebral cortex, and medial cortex are all affected in the event of a trauma. The amygdala is the center for emotions and motivation. The hippocampus forms memories and facilitates learning. The hypothalamus connects the nervous system to the pituitary gland at the base of the brain. The cerebral cortex is responsible for maintaining memories and expression of individuality. Lastly, the medial cortex is responsible for major cognitive functions. In my program, I have various buttons which represent either a trauma or a medication. The trauma is shown as red dots and the medication is shown as blue dots. I used a sticker of a brain separated into portions to display the major divisions in the mind. When clicking a trauma or medication button, the dots flow over the brain and stick to the portions that they affect. This displays in a more compact and exact way where the damage is done by each trauma as well as where the medications are more efficient.

Fear and Anxiety Affect the Brain Architecture of Learning and Memory

PREFRONTAL CORTEX

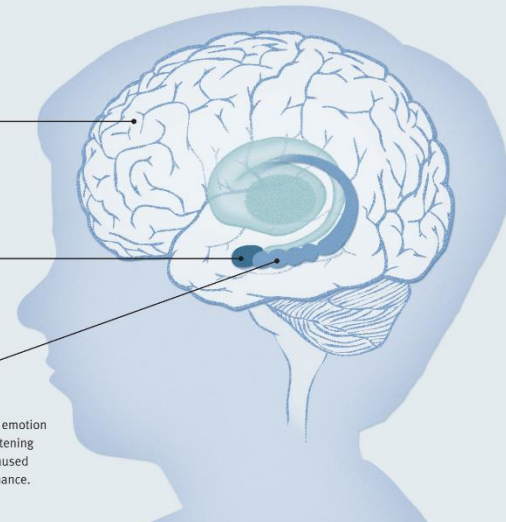
Center of executive functions; regulates thought, emotions, and actions. Especially vulnerable to elevation of brain chemicals caused by stress. Matures later in childhood.

AMYGDALA

Triggers emotional responses; detects whether a stimulus is threatening. Elevated cortisol levels caused by stress can affect activity. Matures in early years of life.

HIPPOCAMPUS

Center of short-term memory; connects emotion of fear to the context in which the threatening event occurs. Elevated cortisol levels caused by stress can affect growth and performance. Matures in early years of life.



Verification and Validation

As a patient of PTSD, it was easy to connect the studies with my own personal experience. Since I used to see a therapist, I had multiple charts and questionnaires' in determining if a patient had PTSD based on their symptoms. I connected these with my own symptoms as well as gathering statistics and information from several permissible sites. This is a research-based project so the verification and validation come from previous studies.

Results and Conclusion

My priority was determining which portions of the brain are most vitiated by each event. I also studied which medications are most efficient based on the damage. According to previous research, it has been determined that neglect results in inhibited brain growth as well as damage to the amygdala and diminished volume to the hippocampus. These are the center portions of the brain. In my program, the neglect button will allow the "trauma" to flow over the brain and it will stick in the middle area of the brain sticker. The events of blunt force and shaking both had similar results as they show an initial damage to the first point of contact with the skull as well as following damage to the opposite side of the skull where the brain bounces off. With my project, I assumed the blunt force would be towards the front of the skull as I would be able to show the adverse effects on the opposite side of the skull with a side view. This is also relevant with shaking. As shaking involves a back and forth movement, it is more likely to be involving the frontal lobe and cerebral cortex in the back of the brain. Therefore, these were the areas displayed to have damage when affected by the trauma. I also did extensive research on various forms of medication. Medical marijuana is a controversial form of alternative medication. It is also legal in New Mexico for patients with PTSD. I decided to study the effects that medical

marijuana has on the brain. I discovered that this form of medication is helpful in reviving the hippocampus of the brain as well as relaxing and restoring the amygdala. This confirms that patients who suffer from PTSD as a result of neglect, are more likely to react positively to medical marijuana. Chemical medication can be altered to fit various forms of PTSD and attach to customized portions of the brain. However, it also increases the amount of dopamine in your system. This neurotransmitter creates habit-forming euphoria in the mind. It is also well known that chemical drugs can dilute the sense of emotions altogether. Doctors claim that these drugs should only be given to patients in the event of sleeplessness, overwhelming depression, or suicidal thoughts or actions. Therapeutic medication has been proven to affect mainly the cerebral cortex of the mind. This allows the patient to not only make new memories, but to turn the previous memories into an aid for the imminent growth of your mind. Extensive therapy allows the patient to control their own thoughts to the best of their ability. This is the most recommended form of recovery for PTSD patients. Alternative medication may still be required based on the severity of the trauma as well as the severity of the symptoms.

Based on the extensive amount of research, studies, and brain scans, it is possible to determine that PTSD is not only affected by memory, but also by traumas absorbed by the brain. Since young minds are so sensitive in their developmental stages, it is easy to be altered by those events. It seems even more likely that children will obtain PTSD than soldiers who have seen combat. Although the symptoms may not be as strong and the recovery process may not be as difficult. There are not as many studies on abuse in children and the detrimental effects on their minds. Through this project, I hope to bring more awareness to the issue. Our children are our future.

Software

Although my code is still in progress, attached is a printout of my project code. This project is based on NetLogo. (Attachment A)

Significant Achievements

I will never say that I regret the trials and tribulations that I have been through as they have made me who I am today. I am very lucky to have the opportunities that have been provided to me. However, I still struggle with my mentality. By doing this project, I was better able to understand exactly why I face these problems and allowed me to understand that I am not alone. I am so passionate about sharing this message and the New Mexico Supercomputing Challenge has given me a platform to provide education on the matter. This project was not made to find some extravagant solution or create new technology. This project is based solely on the fact that there are thousands that suffer every day from an illness that is out of their control. They feel trapped and isolated inside that trauma. By expanding the knowledge on PTSD outside of combat, I feel I can bring more of an understanding towards the struggle of so many more people than we know.

Acknowledgement

I would like to thank my teacher and mentor Mr. Alan Daugherty for allowing me to become a part of the Supercomputing Challenge and assisting me over the years through various projects in order to expand my knowledge on the growing technological environment.

Attachment A

BrainPic - NetLogo (P:\AAAS SCIENCE SCIENCE AAA-2018\AAA- SCIENCE-SCIENCE-SCIENCE\Supercomputing\Brain)

File Edit Tools Zoom Tabs Help

Interface Information Procedures

Find... Check Procedures

```
breed [trauma traumas]
breed [medicine medicines]

to setup
  reset-timer
  crt 100
  [set breed trauma
    set color 12 ;setting up trauma
    set shape "dot"
    set size 10
  ]
  ask trauma [setxy -244 random-ycor ]
end

to shake
  ask trauma
  [
    set heading 90 fd 1
    if pcolor = 97.9 and xcor < -188 [if random 10 < 5 [set pcolor 12 stop]]
    if pcolor = 16.9 and xcor > 194 [if random 10 < 5 [set pcolor 12 stop]] ;shaking affects frontal and cerebral cortex
    if xcor = -190 [die]
  ]
end

to neglect
  ask trauma
  [
    set heading 90 fd 1
    if pcolor = 97.9 and ycor < 39 and xcor > -110 [ if random 10 < 5 [set pcolor 12 stop]]
    if pcolor = 57 and ycor > -20 and xcor < 70 [if random 10 < 5 [set pcolor 12 stop]] ;neglect affects middle portion of the brain
    if pcolor = 46.9 and ycor < 56 and xcor < 54 [if random 10 < 5 [set pcolor 12 stop]]
    if xcor = -246 [die]
  ]
end

to blunt-force
  ask trauma
  [
    set heading 90 fd 1
    if pcolor = 97.9 and xcor < -188 [if random 10 < 5 [set pcolor 12 stop]] ;blunt force is similar to shaking
    if pcolor = 16.9 and xcor > 194 [if random 10 < 5 [set pcolor 12 stop]]
    if xcor = -190 [die]
  ]
end

to medicate
  reset-timer
  crt 100
  [set breed medicine
    set color blue
    set shape "dot"
    set size 10
```


BrainPic - NetLogo (P:\AAAS SCIENCE SCIENCE AAA-2018\AAA- SCIENCE-SCIENCE-SCIENCE\Supercomputing\Brain)

File Edit Tools Zoom Tabs Help

Interface Information Procedures

Find... Check Procedures

```
if xcor = -190 [die]
]
end

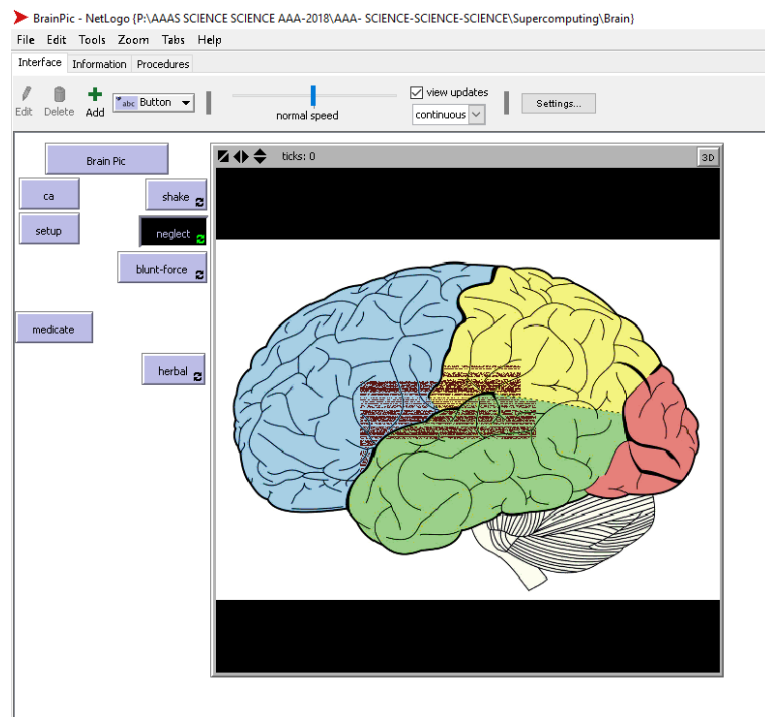
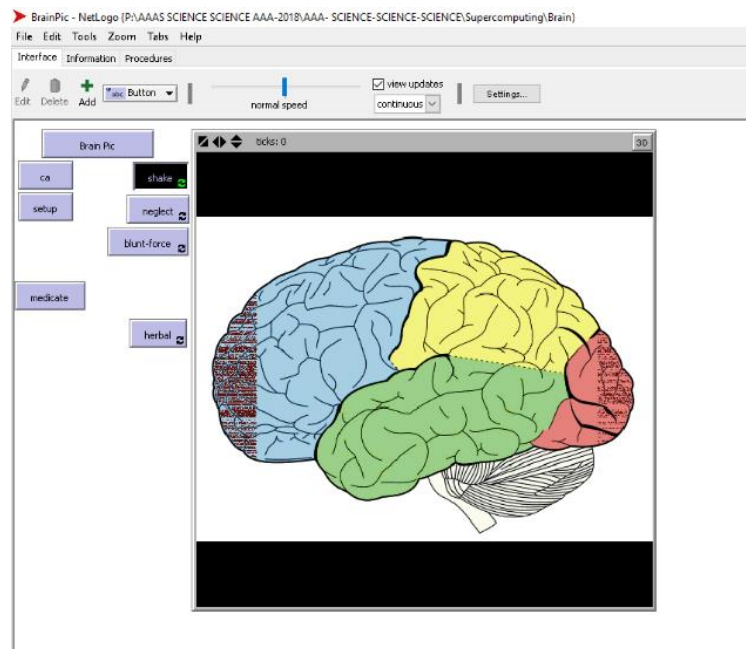
to neglect
  ask trauma
  [
    set heading 90 fd 1
    if pcolor = 97.9 and ycor < 39 and xcor > -110 [ if random 10 < 5 [set pcolor 12 stop]]
    if pcolor = 57 and ycor > -20 and xcor < 70 [if random 10 < 5 [set pcolor 12 stop]] ;neglect affects middle portion of the brain
    if pcolor = 46.9 and ycor < 56 and xcor < 54 [if random 10 < 5 [set pcolor 12 stop]]
    if xcor = -246 [die]
  ]
end

to blunt-force
  ask trauma
  [
    set heading 90 fd 1
    if pcolor = 97.9 and xcor < -188 [if random 10 < 5 [set pcolor 12 stop]] ;blunt force is similar to shaking
    if pcolor = 16.9 and xcor > 194 [if random 10 < 5 [set pcolor 12 stop]]
    if xcor = -190 [die]
  ]
end

to medicate
  reset-timer
  crt 100
  [set breed medicine
  set color blue ;creating medication
  set shape "dot"
  set size 10
  ]
  ask medicine [setxy -244 random-ycor]
end

to herbal
  ask medicine
  [
    set heading 90 fd 1
    if pcolor = 97.9 and ycor < 39 and xcor > -110 [ if random 10 < 5 [set pcolor blue stop]]
    if pcolor = 57 and ycor > -20 and xcor < 70 [if random 10 < 5 [set pcolor blue stop]] ;herbal medication is efficient for recovering from neglect
    if pcolor = 46.9 and ycor < 56 and xcor < 54 [if random 10 < 5 [set pcolor blue stop]]
    if xcor = -246 [die]
  ]
end
```

Ask me anything

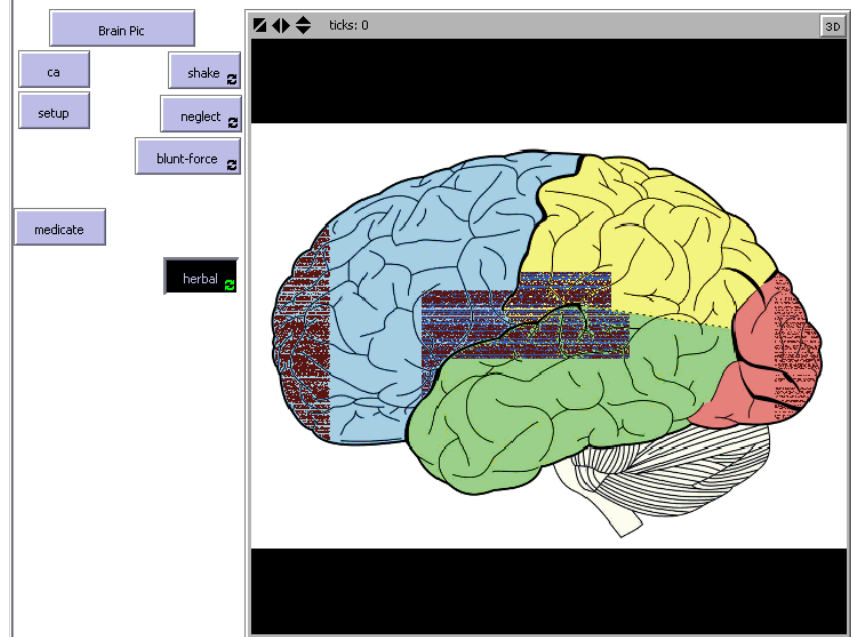


BrainPic - NetLogo (P:\AAAS SCIENCE SCIENCE AAA-2018\AAA- SCIENCE-SCIENCE-SCIENCE\Supercomputing\Brain)

File Edit Tools Zoom Tabs Help

Interface Information Procedures

Edit Delete Add Button normal speed ☒ view updates continuous Settings...



Citations

DH Information. "PTSD Drugs Pros and Cons." DH Information 2018. <

<http://www.dhinfo.org/2011/02/ptsd-drugs-pros-and-cons/> April 2, 2018

National Center for Biotechnological Information. "Trauma, PTSD, and Attachment in Infants and Young

Children." NCBI December 2016. < <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3181836/>

April 2, 2018.

National Center for Biotechnological Information. "Traumatic Stress: Effects on the Brain." NCBI

December 2016. < <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3181836/> April 2, 2018.

U.S. Department of Veteran Affairs. "PTSD in Children and Teens." U.S. DVA August 13, 2015. <

<https://www.ptsd.va.gov/public/family/ptsd-children-adolescents.asp> April 2, 2018.