The Effects of Mood and Depression on the Brain

Seminar in Neuroscience
Me, My Brain, and I

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According to the National Alliance of Mental Illness

- About 20 million people in the United States suffer from depression each year.
- Women are more likely to suffer from depression than men.
- Depressed individuals are more likely to be diagnosed with a sickness, like colds.
- Negative thoughts and environments can contribute to depression and increase vulnerability to illness.
- Depression is a common mental disorder. Globally, more than 350 million people of all ages suffer from depression.
Are You Depressed?

* According to Psychcentral.com
  * Symptoms of depression:
    * Negative or distorted thinking
    * Difficulty concentrating
    * Distractibility
    * Forgetfulness
    * Memory loss
    * Indecisiveness
  * Can result from previously diagnosed disorders and stress
  * Can be linked to mood changes and also cognitive decline
How does mood/depression affect cognition?

How does mood/depression affect the brain?
  - Does poor connectivity within the brain have an effect on cognitive decline?
  - Connectivity – the quality of the connection between 2 or more brain regions

Strategies to improve mood
Cognitive decline is when a noticeable decline in cognitive abilities occurs, i.e. memory and thinking skills (alz.org)

According to Cook et al. (2007), cognitive decline occurs when brain regions such as the prefrontal cortex and the hippocampus begin to deteriorate

- Can cause the connections between the brain regions become weak.
- This naturally occurs as the brain ages, but a positive mood can help slow this process.
Depression has been linked to the inability to remember things and make decisions.

Are you experiencing changes in mood that you believe might be linked to depression or cognitive decline?

You can take an online test at http://psychologytoday.tests.psychtests.com/bin/transfer?req=MTF8MTMwOHw1NzA1OTgyfDF8Mg==&refempt to assess your depressive symptoms.
### Questions You May Be Asked

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<td>1. I feel sad.</td>
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<td>2. I feel agitated or restless (I pace, am unable to stay calm, or need to move constantly).</td>
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<td>3. I feel worn out.</td>
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<td>4. I feel so guilty that I can barely take it.</td>
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<td>5. When I wake up in the morning, I feel like there is nothing to look forward to.</td>
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<td>6. I think about death.</td>
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<td>7. When needed, I can make up my mind quickly.</td>
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<td>8. I get mad at myself if I do not achieve the goals I have set out to reach.</td>
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There are many factors that can cause cognitive decline to occur more rapidly than normal

- Emotional problems can make a person more forgetful or confused
  - Often mistaken for a type of dementia – pseudodementia
- Pseudodementia is when an individual who has depression also has dementia (mentalhelp.net)
- According to Carrie Steckl, PhD., pseudodementia is not permanent. Once a person’s depression symptoms are successfully treated, his/her cognitive symptoms will go away as well. (If the case is true pseudo-dementia and not real dementia)
In an article by Eric D. Caine in 1981 there are studies cited that examined dementia patients and found that they suffered from other psychological disorders such as depression, but showed similar symptoms to dementia. Researchers discovered that patients did not fit the full diagnostic for dementia, and therefore the term pseudodementia was coined for those who had dementia symptoms but not enough for diagnosis.
Pseudo-dementia is not a medical term, and is not a diagnosis. It is simply a better way to understand patients, and avoid misdiagnosis and mistreatment of other psychological disorders.
Late-life depression is frequently associated with cognitive dysfunction (Butters et al 2000). Many older adults who suffer from depression report having difficulty with concentration and memory. These cognitive functions are directly linked to slowed processing speed (how quickly you can understand what you are seeing, hearing, reading etc.) and working memory (what you are thinking about at this very moment) as a result of depression (Ingram et al., 2007).
Mood affects decision making
Forgas et al., 1987

Subjects: 49 undergraduate students

Methods:
- A positive or negative mood was induced in subjects through manipulated feedback about their performance on a bogus test in order to test the effects of positive or negative moods.
- Next, four realistic person descriptions were presented to the subjects, each containing an equal number of positive and negative details.
- The time it took for subjects to read each descriptive sentence and to make each judgment was recorded.
- Finally, subjects' memory for details of the people described in the descriptions was tested.
Results:

- Happy individuals made immediate, positive decisions
- Sad individuals made slower, negative decisions
- Mood (positively/negatively) affected memory.

This research suggest that a positive mood leads to improved encoding, information availability, and decision making processes in the brain.

Depression on Cognitive Decline

Shahnawaz et al., 2012

- Subjects: 767 healthy community-dwelling adults aged 70-90 years old
- Method: Comprehensive assessments were completed
  - Depression
  - Memory
  - The researchers used a questionnaire to examine the severity of key aspects of dementia such as:
    - Hallucinations
    - Delusions
    - Dysphoria/Depression
    - Disinhibiton
The Findings

* This study shows that a greater percentage of depressed patients meet the criteria for Mild Cognitive Impairment (MCI) than those without depression symptoms
  * According to the Alzheimer’s Association, MCI causes a slight but noticeable and measurable decline in cognitive abilities
  * Also shows that a greater percentage of patients who meet the criteria for MCI suffer from symptoms of depressions than those who are cognitively normal.

Fig. 1. Percentage of the sample with mild cognitive impairment: Geriatric Depression Scale (GDS) < 6 vs. GDS ≥ 6 (a). Percentage of the sample with GDS ≥ 6 (b). *P < 0.05; MCI, mild cognitive impairment; aMCI, amnestic mild cognitive impairment; n-MCI non-amnestic mild cognitive impairment; CN cognitively normal; GDS (15 item version).
According to the National Alliance of Mental Illness,

- Not only does depression have an effect on cognitive decline, but cognitive decline can also have an effect on depression.
- Individuals who have increased cognitive decline may be at risk for depression.
  - Depression symptoms may be present due to cognitive decline.
- The link between mood, depression, and cognition can go in any direction.
  - i.e., depression can be caused by cognitive decline, cognitive decline can be caused by depression, mood can be affected by depression, and depression can be affected by mood.
- This is different for every individual.
Effects of Mood On The Brain

* Poor Connectivity
* According to Anand et al. 2005,
  * Brain connectivity is how one brain region shares information with another brain region.
  * When connectivity is poor, it is more difficult for the brain to carry out functions such as paying attention, or putting a thought into words.
How it Works
*Functional Magnetic Resonance Imaging (fMRI)*

*According to the Mayfield Clinic, fMRI is a neuroimaging technique that measures brain activity by detecting associated changes in blood flow*
Yue et al. (2013)

Subjects: 22 patients with Late-onset Depression and 22 healthy controls

Depression symptoms measured by a rating scale

Connectivity was assessed through fMRI

According to the Nuffield Department of Neuroscience, fMRI is neuroimaging technique that measures brain activity by detecting associated changes in blood oxygen levels
The Findings

- Altered connectivity between the amygdala and prefrontal cortex was observed in patients with depression.
- Results indicated that depression patients show cognitive impairments related to attention, memory, and planning.
- This decreased connectivity was associated with cognitive impairment.
- The changes in connectivity of amygdala networks could be an indicator of cognitive dysfunction.
Mood and Impact On The Hippocampus

- Studies show that there are significant gray-matter reductions in the hippocampus in patients with Major Depressive Disorder.
- Hippocampal volume negatively correlated with depression severity (Stratmann, 2014)
Antidepressants:

- According to the National Institute for Mental Health, antidepressants are drugs used to treat depression.
- Most common Antidepressant Types Used Today:
  - Selective serotonin reuptake inhibitors (SSRIs)
    - Zoloft, Prozac
  - Serotonin and norepinephrine reuptake inhibitors (SNRIs)
    - Cymbalta
- Antidepressants can improve cognitive abilities (Butters et al. 2000)
- Antidepressants have been shown in multiple studies to be a very effective form of treatment when it comes to depression.
In 2000, Butters et al. examined the cognitive response to treatment (antidepressants) for adults with late life depression.

**Subjects:** 62 elderly patients (ages 65+) with major depression and 20 non depressed elderly patients.

- Some cognitive impairment was present but no subjects met the criteria for Alzheimer's disease.

**Method:** Baseline data were collected by testing

- Depression
- General cognitive functioning
- Global assessment of psychological, social, and occupational functioning
- Dementia
Subjects were randomly assigned to receive either a placebo drug, or a serotonin reuptake inhibitor (SSRI).

After 12 weeks of receiving either the placebo or the SSRI subjects were rescreened using the same tests used for baseline data.

Results: Over 50% of subjects achieved successful remission of their depressive symptoms.

Successful depression treatment led to significantly improved cognitive functioning among elderly depressed patients with baseline cognitive impairment.
Why is Butters et al.’s research so compelling?

- The antidepressants had a positive effect on subjects in just 3 months.
- Over half of the subjects were successful when using the antidepressants.
- Along with improved mood, the subjects’ cognitive functioning improved while taking antidepressants.
Tips on “Keeping Your Brain Sharp” from the National Institute on Aging

- Find activities, such as exercise or a hobby, to relieve feelings of stress, anxiety, or depression.
- Monitor your mood
  - Keep a journal of times you are feeling down
- Talk to your doctor about your depression symptoms
  - Depression can be a symptom of dementia (alz.org)
Depression has been shown to increase cognitive decline (Butters et al 2000).
It is important to be vigilant and take action whenever you feel depressed in order to improve your cognition.
Be aware of the relationship between depression and cognition and how it can affect your brain.
Depression leads to less hippocampal volume and a decrease in gray matter.
A positive mind can limit cognitive decline.
Thank You For Joining Us!

Questions?
Electronic Sources

* https://www.mentalhelp.net/articles/reversible-cognitive-disorder-pseudodementia/
* https://www.nami.org/Search?searchtext=depression+facts&searchmode=anyword
* http://psychcentral.com/lib/the-cognitive-symptoms-of-depression/00016214
* http://www.mayfieldclinic.com/PE-fMRI_DTI.htm#.VSm6paayhFI
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