Annie C., Christopher Z.
Dr. Allendoerfer
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The Effects of Muscle Dysmorphia Disorder on the Brain

Introduction

Body Dysmorphic Disorder (BDD) is a common, but highly underrepresented psychological disorder. It is present in around 2% of the population, which is more common than better known OCD and anorexia nervosa, and can lead to suicidal tendencies and death. Furthermore, BDD is rarely diagnosed and treated, and research for treatment on BDD is severely lacking (Phillips, 2014, p. 325). Our paper will focus on diving deeper into research on BDD, how people with BDD experience abnormalities in the brain, where these abnormalities take place, what neurotransmitters are affected, and how we can use this information to target treatments for BDD.

BDD is a psychological disorder - meaning it's a condition that has a negative, and sometimes crippling impact on the daily life of the victim. People with BDD, also known as "dysmorphophobia", are uncontrollably preoccupied by their perceived defects in their appearance, and experience significant levels of distress from internal thoughts. Many times, preoccupations can include skin defects (acne, wrinkles, scars, birthmarks), hair, nose, and body type (body fat, muscle composition, body proportions), and occur throughout the day for up to 8 hours of thoughts of disgust. Some individuals with BDD act similar to those with OCD - forming "rituals" and strict routines to excessively check their looks, hair, etc. These preoccupations can overtime trigger depression, anxiety, shame, and emotional damage (Phillips, 2014, p. 325, 326). BDD affected brains don't experience abnormalities in outward appearance, but "function abnormally when processing visual details" (Schmidt, UCLA).

There are two main specific subgroups of BDD: Muscle Dysmorphia (MD, sometimes known as "bigorexia" or "reverse anorexia"), which usually affects men who perceive their bodybuild as too small, and BDD by Proxy, which involves perceived imperfections in the physical appearance of another person. Insight, which is an indicator of the level of insight an individual holds regarding their BDD preoccupations, ranges from poor to good/fair insight (Phillips, 2014, p. 326). In this project proposal, we will focus on Muscle Dysmorphia.

MD still lacks research, and many debate if MD is an eating disorder, behavioral addiction, or a form of OCD. MD mainly affects men, especially those of which are into fitness and bodybuilding. Someone with MD often lifts weights excessively, uses anabolic steroids or performance enhancing drugs (PED), avoiding mirrors, or skipping social activities to exercise.

People with MD can also develop orthorexia, an eating disorder characterized by an obsession in eating healthy foods.

MD can be identified with the Muscle Dysmorphic Disorder Inventory (MDDI), a 13 question survey to assess the severity of MD among individuals (Zeeck, 2018), but can also be more accurately diagnosed by professionals. Current treatments for MD include cognitive behavioral therapy (CBT) or selective serotonin reuptake inhibitors (SSRI), which are expensive, sometimes ineffective, and inaccessible to many (Yetman, 2020).

We chose to focus on MD because of the closeness of its impacts on our lives. Individuals who participate in fitness and bodybuilding activities are at significantly higher risk to develop MD (17%) or an eating disorder (33.9%) (Zeeck, 2018): As a fitness enthusiast and beginner bodybuilder, Christopher has witnessed and even experienced MD at varying magnitudes. Seeing people in the gym working out in hoodies, to avoid seeing their bodies in the mirrors. Becoming extremely strict with his own diet and workout routine, counting each calorie and gram of food eaten. Seeing his own body as being a lot smaller than it actually is, and constantly comparing himself to unrealistic examples of fitness models. And, of course, being completely engrossed in lifting weights. This very mild case of MD on Christopher has changed his entire lifestyle, from all the meals he cooks and eats, to his sleeping and workout routine shaping his every day. We are interested in finding inexpensive, accessible, and effective methods of treating MD at various levels of severity.

Research Question, Hypothesis, and Prediction

Research Question

Do people with MD experience abnormalities in the occipital lobe of the brain, and if so, what neurotransmitters are affected, and how can we use this information to target specific treatments for varying levels of MD severity? Do individuals with MD and related eating disorders experience loss of brain volume?

Hypothesis and Prediction

We hypothesize that people with MD do experience abnormalities in the occipital lobe of the brain. Specifically, we believe that serotonin levels will be anormal, thus accounting for the changes in sleep, mood, behavior, and appetite in individuals with MD (UKEssays, 2018). So, if serotonin levels can be regulated using methods more accessible and less demanding than SSRIs, then more people with varying severities of MD can be treated. We also predict that due to both the restrictive mindset of eating disorders and the lack of nutrition the brain gets from restrictive eating habits caused by MD and subsequent disordered eating, the brains of people with these conditions will likely have an overall decrease in the size of the brain, for both white and gray

matter.

Methods

Participants

Participants will be recruited through online advertisements targeting websites, forums, and videos related to fitness, bodybuilding. They will also be recruited through waivers handed out at local bodybuilding-focused gyms. The advertisements, when clicked on, will prompt the user to take the MDDI, and based on their score (severity of MD), will send them an email recruiting them for a research study. The emails will include a huge money reward of $1,000,000 to participate in the study, in order to incentivize honest participation.

Experimental Procedure

Participants will be split into two groups - the control, who report a low score (close to 0 correlation) for the MDDI, and the experimental, who report a high score (reporting a correlation ~0.80)(Zeeck, 2018). The control and experimental groups will have 10,000 participants each, all of which will require prior consent and agreement to all terms in our experiment. The control group will be screened for pre-existing mental and physical abnormalities, and will only be allowed to participate if they pass as healthy. Those who do not pass will earn a $50,000 reward for their time and participation.

The screened control group will be taken in for inspections to determine their serotonin levels in their brains. Although there are currently no methods of finding the serotonin levels in the living brain, serotonin levels can still be measured through a blood draw test (Nazario, 2011). They will also be taken in for MRI scans, to determine the size of their brain.

The experimental group will then be taken in for inspections to determine their serotonin levels. They will also be taken in for blood tests to determine serotonin concentration in blood. They will also be taken in for MRI scans, to determine the size of the brain.

The independent variable will be the MDDI score, with the dependent variables being brain size and serotonin levels in blood. We will also look into other effects, like the frequency of brain waves with an EEG, and activity in each section of the brain.

Expected Results, Implications, and Interpretations

The control group should report back a blood serotonin level of 101-283 nanograms per milliliter of serotonin, considered normal, whereas we expect the experimental group to report back a lower serotonin level. This opens up opportunities for treatment using SSRIs, and other more

accessible methods to increase serotonin (such as eating tryptophan rich foods, cardio, bright light exposure, SAMe, 5-HTP, Probiotics, and Mood induction) (healthline, 2019).

We also expect that the size of the brain for individuals in the experimental group will be noticeably smaller and less voluminous than those in the control group, due to the disordered eating and malnutrition that comes with MD. We also expect from the experimental group to see increased prevalence of alpha waves in the occipital lobe, due to the abnormalities caused in visual processing by MD.

We hope that more papers can be made on BDD and MD. The prevalence of this disorder is incredibly high, and incredibly under researched.

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