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Relations of Emotional Functioning and Hormonal Contraceptive Use in UMaine Female Students

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RELATIONS OF EMOTIONAL FUNCTIONING AND HORMONAL CONTRACEPTIVE USE IN UMAINE FEMALE STUDENTS

by

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ABSTRACT

The purpose of this study was to examine the relations of hormonal contraceptive use to emotional functioning in biological women. Hormonal contraceptives contain one of two hormones, progestin and estrogen, which are key regulatory hormones in women. Estrogen and progestin help to regulate brain networks and processes related to changes in stress response, cognition, and emotion regulation. Participants included 86 female college students, ages 18-25, who responded to measures that assessed hormonal contraceptive use, depressive symptoms, relationship quality, and mood. Results revealed no significant differences in depressive symptoms or mood states between women using hormonal contraceptives (51% of the sample) and those not using hormonal contraceptives (49% of the sample). However, negative relationship quality was significantly correlated with depressive symptoms among hormonal contraceptive users. These findings suggest that while hormonal contraceptive use may not be significantly related to depressive symptoms or mood states, there may be an association between relationship quality and emotional well-being in young women who use hormonal contraceptives. Further research is warranted to explore the complex interplay among hormonal contraceptives, relationship dynamics, and emotional functioning.

DEDICATION

I want to dedicate this project to everyone who helped guide me along the way in completing my honors thesis. First, I want to thank the team that stood behind me throughout the duration of this process. Thank you for answering all my questions, providing resources, and overcoming every obstacle with me. Thank you for believing in me and my research.

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INTRODUCTION

Overview

In the past 20 years, there have been increasing numbers of women around the world who are using hormonal contraceptives. There are benefits of use, including pregnancy prevention, acne control, managing irregular periods, and treating symptoms of endometriosis. However, there are also potential risks, such as weight gain, acne, nausea, breast tenderness, spotting in between periods, irregular or heavy bleeding, and even depressive symptoms (National Library of Medicine, 2023). The purpose of the present study is to examine the association of hormonal contraceptive use with emotional functioning in female college students. To provide background for this study, research on depression will be reviewed, including risk factors, etiology, and gender differences. Then, information will be presented regarding hormonal contraceptives, such as what they are, how they work, and how they affect the hormonal and emotional functioning of females. Next, interactions between hormonal contraceptive use and depressive symptoms will be highlighted using current research. Lastly, the purpose of the current study, along with the hypotheses, will be presented.

Depression

Depression is a mental health disorder that an estimated 21 million people in America suffer with (Duszynski-Goodman, 2023). Depression is defined as a type of mood disorder that can lead to a person feeling helpless, sad, and tired. There are many symptoms of depression, including feelings of sadness, hopelessness, or emptiness. In addition, there may be emotional outbursts, irritability, increased fatigue, insomnia, over-sleeping, anxiety, restlessness, slowed speaking, and delayed physical reactions. In

extreme cases, depression can lead to suicide attempts (Mayo Clinic, 2022). Depression can affect anyone regardless of age, gender, sexual identity, or health. Depression can cause individuals to act differently in their day-to-day lives, impacting how they feel, think, act, and perceive themselves and others (Mayo Clinic, 2022). Depression can affect people for a period of their lives, or for their entire lives. The best treatment for long-term depression is psychotherapy in combination with medication (Mayo Clinic, 2022).

Risk Factors for Depression

Although depression can affect anyone, there are certain groups that tend to be more at risk for depression than others. Some of the more at-risk groups include pre-teens and teens, women, people who experience low self-esteem, and people who suffer with other mental health disorders (Mayo Clinic, 2022). About one in six people will develop depression in their lifetime, and teens and pre-teens are even more susceptible than adults to this mental health disorder. Depression affects over two million teenagers each year in the United States (Schwartz, 2015). Teenagers are more at risk for depression due to a variety of factors, some of which include physical changes such as weight fluctuation, problems with peers or peer rejection, bullying, and academic issues (Mayo Clinic, 2022). Teenagers' minds are not fully developed, and they are also experiencing many hormone fluctuations during this time, which can contribute to the issues listed above.

Depression is more prevalent among women than it is in men (National Library of Medicine, 2023). Women are more at risk for depression than men due to a variety of societal and biological factors. Some of the societal factors that put women more at risk are social inequality to men, higher academic pressures put on women in comparison to men, and social sexism. Some of the biological factors that put women more at risk for

depression are variations in hormone levels, more specifically, decreases or deficits of estrogen levels. These factors will be discussed further in the *Gender Differences in Depression* section below.

One of the correlates of depression is low self-esteem. Therefore, at any age, people who experience low self-esteem before developing depression are much more susceptible to the disorder than those who do not struggle with their self-esteem. At the same time, those who are struggling with depression are more likely to have negative thoughts about themselves that result in lower self-esteem. Thus, there appear to be bidirectional influences between low self-esteem and depression. Roughly one in ten women in the United States suffer from depression symptoms, with different levels of severity (Center for Disease Control and Prevention, 2023). Anxiety and depression are the two most prevalent mental health disorders amongst people at any age, and oftentimes they coexist with each other at the same time within one person. Although it is possible to struggle with just one of these mental health disorders, more often than not, having either anxiety or depression can cause the other one to follow suit, making them comorbid. A study conducted by Deady et al. (2022) examined how depression and anxiety individually and comorbidly affect individuals' workplace performance and attendance. Using a self-report survey, 4,953 people reported on their experiences with anxiety, depression, or both and how these disorders affect their work performance and attendance rate. Out of the sample, sixteen percent of participants met the cut off for being comorbid. The people who suffered with the comorbidity of depression and anxiety reported greater symptom severity, poorer work performance, and lower attendance than any other group in the study (Deady et al., 2015). This study goes to show that individuals who suffer

with other mental health disorders, such as anxiety, are more at risk of developing depression. Not only are they at risk of developing depression, but also suffering the effects of depression can interfere with their professional and personal lives.

Etiology of Depression

There are many biological factors that can cause depression in people. Depression is associated with increased levels of monoamine oxidase A, which is an enzyme in the brain that breaks down important neurotransmitters. Higher levels of monoamine oxidase A result in low levels of serotonin, dopamine, and norepinephrine. Serotonin, dopamine, and norepinephrine are chemicals in the brain that help promote happiness and energy levels (jax.org). Of note, early in the pubertal process, adolescents experience decreases in serotonin and dopamine, and this plays a significant role in the increase in depression during the adolescent years (Leone, 2022).

One of the major risk factors for adolescents when it comes to depression is a lack of emotional awareness, causing their emotions to run at a higher intensity than that of an adult, therefore putting them far more at risk for developing depression and anxiety symptoms. In a study conducted by Kranzler and Hankin (2015), 204 adolescents completed self-report surveys on emotional awareness, as well as depression and anxiety symptoms. It was found that over a one-year period, low emotional awareness predicted the prevalence of depression or anxiety symptoms in adolescents (Kranzler & Hankin, 2015). Another risk factor for adolescents in regard to depressive symptoms is rumination, or dwelling on negative feelings. Rumination is more common in adolescent girls than it is in boys, but it can negatively affect either gender (Krause et al., 2017). In another study conducted by Hankin (Hankin et al., 2016), rumination was assessed at

baseline in 350 middle school students measuring symptoms of depression, anxious arousal, general internalizing, and externalizing problems. It was found after being assessed at four points in time over a five-month period that rumination predicted fluctuations in symptoms of depression and internalizing problems, more so in female students than in males.

Environmental interactions can also serve as risk factors for depression. For example, people who experience childhood trauma are more at risk of developing depression due to the inflammatory levels of C-Reactive Proteins and Interleukin (Zuzanna et al., 2021). These are proteins made by the liver and the white blood cells to fight off infection and regulate immune responses. It has been found that traumatic experiences can cause inflammation of these proteins, which can lead to depression.

Adolescents and children with depression have been found to be at an increased risk of physical illnesses and premature death (Leone et al., 2022). In a study conducted by Leone et al., researchers gathered medical information from nearly 1.5 million people and followed them up until the age of 31 years. It was found in this study that more than 37,000 people were diagnosed with depression between the ages of five and nineteen years old. It was also found that people with depression are at an increased risk for medical conditions such as sleep disturbances, self-harm, type two diabetes, thyroid disorders, liver problems, and kidney disease. This increased risk for medical conditions makes these people almost six times more likely to die prematurely than their peers who do not suffer from depression. Leone et al. (2022) also reported that people who suffer with endocrine and metabolic diseases are at an increased genetic risk of depression. In a comparison between siblings who had diagnosed endocrine and metabolic disorders and

siblings without these disorders, it was found that the siblings with the endocrine and metabolic disorders had a two-fold increased risk of developing depression. It has also been found that people with sleep disorders are at an increased risk of developing depression. By using a sample of over 25,000 children and adolescents who were prescribed melatonin in Sweden, 87% of this sample had at least one diagnosed mental health disorder, depression being one of the most common in the sample (Leone et al., 2022).

There are also many social factors that increase risk for depression amongst people of all ages. Significant risk factors for depression include economic situation, alcohol use, smoking, stress, and social capital (i.e., the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintances and recognition – or in other words, to membership of a group) (Cook et al., 2021). Social factors come from the environments and societies that surround us as we go through our lives. Experiencing rough times, such as the factors listed above, can increase one's depression symptoms, putting them much more at risk for developing long-term depression. Education level also plays a large part as a social factor that increases one's risk for depression. People who pursue a secondary education have a much lower risk of developing depression than those who obtain only a primary education. Despite this, people who pursue a secondary education are more likely to experience higher levels of stress, which also puts them at high risk for developing depression (Remes et al., 2021).

Adolescents are extremely susceptible to depression due to the social factors happening at this point in their lives. During adolescence, people undergo many changes

mentally and physically, especially during puberty. These changes can negatively impact their self esteem, making them incredibly vulnerable to depression. For example, during puberty, many people undergo a lot of physical changes such as weight gain, increased acne, and general changes in their bodies. This can cause some people to have lower self-esteem, which is a leading risk factor in depression. Not only do adolescents experience physical changes, but also they undergo a lot of mental changes. Early adolescence is when most people begin to explore their own identities. Identity is formed by our brain chemistry and our environments. If an adolescent is experiencing bullying or peer victimization during this period of learning about their identity and expressing themselves, then they are more likely to develop depression. It has also been found that those who identify in ways that are different from societal norms (e.g., in gender identity or sexual orientation) are at a greater risk for depression. Adolescents who are members of the LGBTQ+ community are four times more likely to attempt suicide than heterosexual/cis people. It has also been found that adolescents that identify as bisexual report higher rates of depressed mood, physical harm, and sexual assault (The Trevor Project, 2023). Adolescents can also experience high stress levels while forming and learning about their relationships in their lives. Dating can cause a lot of stress on adolescents as they learn how to have these relationships in a healthy way. In a study that analyzed the prevalence of teen dating violence using a large sample of middle school youths, it was found that 77% of youth reported perpetrating emotional/verbal abuse, 20% reported threatening their partner, and 15% reported perpetrating sexual abuse (Niolon et al., 2015). After analyzing the gender differences, it was found that girls reported perpetuating threatening behaviors, emotional abuse, and physical abuse more

than boys, but boys reported perpetuating more sexual abuse than girls (Niolon et al., 2015). It was found in the study that emotional factors and processing at the age assessed (12-15 years) are risk factors for girls engaging in perpetuating behaviors such as emotional abuse, physical abuse, and threatening behaviors (Niolon, 2015). Stress can also come from other relationships in an adolescent's life such as their friends and family. As adolescents begin to explore their identity more, they also begin to seek more independence from their families. This can cause familial issues, also increasing stress levels which puts them more at risk. Adolescents with a parent or grandparent who struggles with depression are more likely to experience depression than others, likely due to the contagion effects of interacting with people who engage in depressive thoughts and behaviors, though genetic factors can also play a role (Center for Disease Control and Prevention, 2023).

Gender Differences in Depression

Women are twice as likely as men to be diagnosed with depression, making depression the number one cause of disease burden amongst women. It has been found that higher self-esteem, more adaptive problem-solving skills, and help-seeking are three of the most important factors in reducing women's risk of suicide attempts as a result of depression (Khezeli et al., 2019). Although these are three of the most important coping skills for women to have in their toolboxes to avoid the detrimental effects of depression, these are three of the least prevalent coping mechanisms women are able to effectively use. This is due to many factors, including that women are socialized within our societies to be more passive, people-pleasing, and helpless. Women suffer from self-esteem issues due to the immense pressure from society and media to look a certain way and care about

their appearances more than their well-being. Other risk factors found to be very prevalent for women are poor relationship quality and low support (Khezeli et al., 2019). Women are more prone to allow their relationship quality to define their self-worth, so they are especially negatively impacted by negative relationship experiences.

There are numerous biological factors and societal factors that help to explain why women are more at risk for depression than men. The main reason for women being more at risk for depression than men lies in their biological make-up. When women undergo hormone changes during puberty, specifically increases in progestin and estrogen levels, this aspect of their development starts to put them at higher risk for depression (Mayo Clinic, 2022). During puberty, women are beginning to explore and establish their identities sexually and socially. During this time in women's lives as well, they are experiencing more conflicts with their parents and are feeling more pressure to succeed in their academic and sports-related activities (Marshall et al., 2022). Women are societally molded to 'not be good' at sports, which explains this increased pressure to excel in any sports-related activities they are to take on, also adding more stress to their lives. Due to these stressors, women are more at risk of experiencing depressive symptoms.

Another reason women are more at risk has to do with premenstrual problems. Premenstrual Syndrome is a group of changes that occur in women's bodies prior to experiencing their monthly period (WebMD, 2022). Estrogen regulates brain networks and processes related to changes in stress response, cognition, and emotional dysregulation (Albert et al., 2019). These factors are also key to Major Depressive Disorder. When estrogen from hormonal contraceptives alters the brain's naturally

regulated estrogen levels, this puts women at a risk higher for depression (Albert et al., 2019). Although Premenstrual Syndrome usually consists of headaches, bloating, abdominal pain, and breast tenderness that is rather short-lived, many women experience crippling premenstrual syndrome that disrupts their daily lives. Some women have to call out of work, cancel events or appointments, and at times admit themselves into the hospital due to the physical pain they might be in. Because of this, women are more likely to feel depressed due to the disruption of their daily lives causing them to miss out on things or making them feel helpless.

Another factor that increases women's risk for depression has to do with pregnancy. When women become pregnant, they undergo extreme hormonal changes that can increase or cause feelings of hopelessness and depression. Other factors that play into pregnant women being more at risk include lack of social support, lack of financial support, miscarriage, infertility, relationship problems, and physical discomfort. Pregnancy also puts women at elevated risk for Postpartum Depression. Postpartum Depression is a depressive order that occurs in women who have just given birth (Fang et al., 2023). Symptoms of postpartum depression include emotional instability, insomnia, confusion, anxiety, irritability, suicide, and infanticide. Postpartum symptoms of a lesser extent are generally normal for the first week or two after giving birth, but any symptoms that continue longer than that indicate postpartum depression that needs therapeutic and medical treatment (Fang et al., 2023). Later into women's lives, perimenopause and menopause also put women at a higher risk of depression due to hormone levels fluctuating, which can cause many symptoms, such as insomnia, temperature flashes, weight gain, and irritability.

Aside from all of the biological changes that take place and contribute to women being more susceptible to depression than men, women are also experiencing societal factors that put them more at risk than men. Women are considered a minority group in America and most places in the world, due to their unequal positions in society. In society, women are not given equal opportunities in comparison to men, especially in authoritative or power positions. Women also experience higher workloads in academics due to pressure put on them from their teachers, advisors, and family members because of the societal expectations of women in academia (Sharp & Messuri, 2022). In addition to the societal factors listed above, 30% of women worldwide have been victims of sexual assault (World Health Organization, 2021). Moreover, twenty-seven percent of women aged 15-49 years old who have been in a relationship report experiencing some kind of physical and/or sexual abuse from their intimate partner. Women who experience these traumas are much more susceptible to depressive symptoms and depression due to the lasting and detrimental toll these events take on women physically and mentally. Because of the discrimination and victimization of women in our society, women are at a higher risk for depression due to the toll these events and prejudice take on women's physical and mental health.

Coping Mechanisms

Women are particularly more at risk for developing and experiencing the worsening effects of depression due to the types of coping strategies that they typically use. In a study conducted on undergraduate females regarding their coping strategies, it was found that women are more likely than men to have adopted passive coping strategies in relation to childhood traumatic experiences (Lee et al., 2021). Passive coping

strategies are coping strategies that are maladaptive due to their escapism nature. Examples of passive coping strategies include escaping, avoiding, and denial. It has also been found that women are more prone to using rumination as a coping style, which is also maladaptive. Rumination is the act of dwelling, repetitive thinking, and overthinking a situation to the point where it affects confidence and self-esteem levels negatively. It has been found that adolescent girls are more likely to develop and experience rumination that leads to depression due to strict or harsh guidance from their guardians or support systems (Iselin et al., 2022). As a result of these maladaptive coping mechanisms, women are more at risk for depression than other people.

One of the most at-risk groups for depression are women who are in verbally or physically abusive relationships. In a study conducted by Matheson et al. (2007), it was found that although women who have experienced abusive relationships may become familiar with adaptive coping, this does not always result in proactive coping, and rather oftentimes becomes maladaptive including the use of avoidant coping mechanisms in comparison to adaptive ones (Matheson et al., 2007)..

In summary, depression is a commonly diagnosed mental health disorder, and it can lead to a variety of negative consequences for women, including low self esteem, decreased motivation levels, decreased levels of social activity, and suicidal thoughts or tendencies (Albert et al., 2019). Women and people with certain characteristics such as being part of an abusive relationship, utilizing maladaptive coping mechanisms, and being a part of the LGBTQ+ community are more at risk. Another factor that appears to also play a role in women's risk for depression is the use of hormonal contraceptives.

Hormonal Contraceptives

Many women all across the world use hormonal contraceptives. Hormonal contraceptives are a form of birth control that use hormones to prevent pregnancy. Although women who use hormonal contraceptives could be using them to prevent pregnancy, there are many other reasons why women might use them. Hormonal contraceptives have positive effects on chronic acne, irregular periods, treating symptoms of endometriosis, and also preventing pregnancy. The most common forms of hormonal contraceptives in the United States are Intrauterine Devices (IUD), Injectable contraceptives (e.g., the Depo Shot), Oral Contraceptives (the Birth Control Pill), and Implants such as a vaginal ring or arm implant (National Library of Medicine, 2023).

Although hormonal birth control has a lot of positive side effects, there are also negative side effects associated with them. Hormonal contraceptives can cause weight gain, acne, nausea, breast tenderness, spotting in between periods, irregular or heavy bleeding, and even depressive symptoms (National Library of Medicine, 2023). There is a lack of research investigating the negative effects of hormonal birth control, and especially studies that examine the mental health outcomes of women who utilize hormonal contraceptives. Thousands of women have reported an increase in depressive or anxiety symptoms since using hormonal contraceptives (De Wit et al., 2021).

Studies on hormonal contraceptive use is a growing field in research, but there are surprisingly few investigations focused on the longitudinal effects of hormonal contraceptives in women. There have been three studies in the past 60 years of hormonal contraceptive use that employ both structural and functional MRI's to assess the effect of oral contraceptive pills on the brain (Song et al., 2023). This research will be described

below. Although there are studies on the effects of hormonal contraceptives, long-term and short-term, the findings are inconsistent. There is also a lack of replication studies done to help further support many of the conclusions of these studies.

How do hormonal contraceptives work?

When women enter puberty, their uterus begins to release the hormone estrogen with their monthly menstrual cycle. In the middle of one's cycle, their estrogen levels increase dramatically in order to release an egg, marking the beginning of their ovulation cycle. After the egg is released, the estrogen levels fall quickly. Although estrogen serves the purpose of initiating the release of the egg, estrogen also plays a large role in regulating women's moods. Estrogen has been found to increase serotonin levels and serotonin receptors in the brain, modify the effects of endorphins within the brain, and stimulate nerve growth within the brain (Morrison & Tweedy, 2000). It has been found that estrogen withdrawal, fluctuating estrogen levels, and sustained estrogen deficit can cause severe mood disturbances in women (Douma et al., 2005).

Hormonal contraceptives work by preventing ovulation in women, which is the process that occurs during the female menstrual cycle in which an ovary releases an egg (ovum) to be fertilized. The hormones used in these contraceptives are progestin or estrogen, which stop the ovulation process, and can also stop the menstruation process as a whole. Most forms of birth control use both hormones in order to prevent pregnancy, which is their main use. These hormones also provide other benefits (e.g., regulating menstrual periods, decreasing acne) as side effects, which is why they can be used for different reasons other than pregnancy prevention.

The most common form of hormonal contraception used in the United States is the birth control pill (Mayo Clinic, 2023). There are two kinds of birth control pills that are widely used. One is called the Combination Pill. The Combination Pill contains estrogen and progestin. The combination of these two hormones prevents a woman's ovaries from releasing an egg. They also slow an egg's movement through the fallopian tubes, thicken the cervical mucus, and thin the lining of the uterus (Terrence Higgins Trust, 2023). Another form of birth control pills is the Mini-Pill. The Mini-Pill contains progestin, only. This Mini-Pill works by slowing an egg's process through the fallopian tubes, thickening the cervical mucus, and thinning the uterine walls (Mayo Clinic, 2023). There have been reports of the Mini-Pill also suppressing ovulation in some women, but this is not a consistent effect for all users. Both of these pills work on a 28-day cycle with users taking the hormonal pill once a day for 21 days, and then taking a placebo pill (sugar pill) for 7 days.

The second most common form of hormonal contraception in the United States is the intrauterine device (Guttmacher Institute, 2023). The Intrauterine Device (IUD) is a form of Long-Lasting Reversible Contraceptives in which women get a T-shaped piece of plastic inserted into their uterus that releases hormones to prevent pregnancy. There are two types of IUDs, Hormonal IUDs and Copper IUDs. For the purpose of this research, the focus will be on Hormonal IUDs, as Copper IUDs do not contain hormones, but still act as a form of contraception. Hormonal IUDs contain the hormone progestin. The progestin within the IUD works to thicken the cervical mucus, and also prevent ovulation. The shape of the IUD also prevents sperm cells from entering the uterus, where the eggs would be if ovulation were to occur (Planned Parenthood, 2023). Most

IUDs last five years, and there are some brands that last up to ten years. IUDs can be removed at any time per the user's request.

The third most used form of hormonal contraception in the United States is the Implant (Guttmacher Institute, 2023). The Implant is a form of hormonal contraception in which a small tube about four centimeters long gets inserted into the skin of a woman's upper arm. The tube contains the hormone progestogen, which is slowly released into the body to prevent pregnancy. It works to prevent pregnancy by thickening the cervical mucus and thinning the uterine lining. Women can receive the implant every three years, but can have it removed at any time (Planned Parenthood, 2023). Women can also get a vaginal ring as a form of implant, which is a small, flexible ring that sits inside the vaginal opening. The vaginal ring works similarly to the arm implant, but most rings contain both estrogen and progestin to prevent ovulation, thicken the cervical mucus, and thin the uterine lining (National Health Service, 2023).

The fourth most used form of hormonal contraception in the United States is the Depo-Provera Injection. The Depo Provera Injection is a form of hormonal contraception in which the user gets the injection once every three months. When used correctly, this is very effective at preventing pregnancy. The Depo Provera Injection includes the hormone progestin, which works to prevent ovulation and thicken the cervical mucus (Planned Parenthood, 2023). Women can stop receiving the shot at any time, but it is recommended to stop the use of Depo-Provera 8-10 months prior to planned pregnancy (Planned Parenthood, 2023).

Hormonal Contraceptives and the Brain

There have been numerous studies on how hormonal contraceptives interact with the brain's processes. One of these studies aimed to examine the effects of sex hormones on dopamine neurotransmission (Taylor et al., 2023). This study compared two groups, females not on any hormonal medications and females on hormonal contraceptives. They were looking to see how hormonal contraceptives can affect dopamine regulation and movement throughout the brain, as well as impact cognitive flexibility. Hormonal contraceptive users exhibited more dopamine synthesis than the non-users, and they also showed more cognitive flexibility than the non-users. This study goes to show that there are direct correlations between hormone function in the brain such as dopamine, and the use of hormonal contraceptives.

There have been three studies in the past 60 years of hormonal contraceptive use that employ both structural and functional MRI's to assess the effect of oral contraceptive pills on the brain (Song et al., 2023). In one of these studies, it was found that the amygdala was affected (Song et al., 2023). There was a decrease of gray matter in the amygdala in users of hormonal contraceptives in comparison to those who do not use hormonal contraceptives (Ning et al., 2016). This area of the brain is associated with the processing of emotions, including fear. Another one of the three studies mentioned above analyzed females' brain response to faces and the use of hormonal contraceptives (Mareckova et al., 2014). Using FMRI taken on 20 young women, the researchers found stronger neural responses to faces in the right fusiform face area in women taking hormonal contraceptives compared to women who were not (Mareckova et al., 2014). These findings indicate that there is evidence of brain changes in women taking hormonal contraceptives that increase the processing of social cues. The last of the three studies

that used FMRI analyzed stress reactivity and brain structure function in hormonal contraceptive users (Sharma et al., 2020). It was found that the use of hormonal contraceptives during adolescence and puberty caused a blunted stress response and altered brain activation during working memory processing (Sharma et al., 2020). It was also revealed that hormonal contraceptives were linked with more prefrontal brain activation during working memory processing for negatively arousing stimuli (Sharma et al., 2020). Overall, it was found that hormonal contraceptive use does alter stress reactivity in the brain as well as induces changes to the brain structure. This correlation puts women at risk for mood-related mental disorders after hormonal contraceptive use (Sharma et al., 2020).

Negative Effects of Hormonal Contraceptives

There have been some studies that have analyzed the negative effects associated with hormonal contraceptive use. One of these studies examined the associations between hormonal contraceptive use and indicators of well-being such as body image, eating behavior, sleep, and energy level (Gillen et al., 2023). Using a self-report questionnaire administered to women online, it was found through analysis of those factors that longer durations of hormonal contraceptive use were significantly associated with higher body surveillance and engaging in more unhealthy weight control behaviors. In addition, it was found that the greater duration of time hormonal contraceptives were used, the higher was the level of various problems experienced. Hormonal contraceptive use was also associated with lower amounts of average energy, more frequent night awakenings, and more frequent napping behaviors (Gillen et al., 2023). These are all negative effects of hormonal contraceptives that can impact the user's daily life.

Another study that looked into some of the negative effects of hormonal contraceptives analyzed whether girls and young women with ADHD are at an increased risk for depression during hormonal contraceptive use compared to women with ADHD who did not use Hormonal Contraceptives (Lundin et al., 2022). Through analyzing medical data using Cox Regression Models, it was found that women with ADHD who were also taking hormonal contraceptives faced a five times higher risk of developing depression than women with ADHD who were not on hormonal contraceptives (Lundin et al., 2022). This risk factor is due in part because most women with ADHD already have cognitive impairments that affect their emotional processes. When battling this in combination with the hormones found in hormonal contraceptives such as progestin, it can cause even more emotional dysregulation and impairment (Lundin et al., 2022).

Hormonal Contraceptives and Depression

Multiple studies have analyzed the correlation between use of hormonal contraceptives and risk for depression. As stated above, estrogen regulates brain networks and processes related to changes in stress response, cognition, and emotional dysregulation (Albert et al., 2019). These factors are also key to Major Depressive Disorder. When estrogen from hormonal contraceptives alters the brain's naturally regulated estrogen levels, this puts women at a risk higher for depression (Albert et al., 2019). One study directly analyzed the association of hormonal contraceptive use and the treatment of depression. This study aimed to investigate whether hormonal contraception is positively associated with subsequent use of antidepressants and the diagnosis of depression at a psychiatric hospital (Skovlund et al., 2016). Using a cohort study with combined data from across the United States, they measured for first use of an

antidepressant and first diagnosis of depression at a psychiatric hospital in association with varying hormonal contraceptive use. It was found that use of hormonal contraception was positively associated with subsequent use of antidepressants and a first diagnosis of depression, especially amongst adolescents (Skovlund et al., 2016). These findings indicate that depression could be a side effect of using hormonal contraceptives and that those who are using hormonal contraceptives are more at risk for depression than those who are not.

Hormonal contraceptives have been reported to have side effects on women's sexual health as well, more specifically regarding their libido. Libido is defined as "sexual desire," which a man or woman can have (Mayo Clinic, 2023). In one systematic review, the researchers used available data via Medline and specified searches to analyze the effects of hormonal contraceptives on women's libido (Burrows et al., 2012). It was found that hormonal contraceptives had mixed effects on women's libido (Burrows et al., 2012). Some women reported higher libidos, and some reported lower, while most reported no change at all. Sexual desire is an important part of sexual relationships, and when it is altered, this can negatively affect one or both partners. According to Gurit E. Birnbaum, Ph.D, "Sexual desire serves as a gauge of a partner's value as a mate." (Birnbaum, 2023). When libido is impacted, this can put women at risk for failing relationships or relationship troubles, which as stated above also puts them at higher risk for depression.

After giving birth, many women either start or return to using hormonal contraceptives in an effort to help regulate their bodies and prevent another pregnancy so soon after the one they just had. Studies have been done regarding the correlation

between depression and hormonal contraceptive use in women, but one study aimed to analyze this correlation more specifically in postpartum women. Postpartum women are already at an increased risk for depression due to pregnancy placing women at elevated risk for Postpartum Depression. Postpartum Depression is a depressive order that occurs in women who have just given birth (Fang et al., 2023). In this study, the association of hormonal contraceptive use with subsequent antidepressant use or a postpartum depression diagnosis was assessed with a time dependent co-variant that measured exposure to hormonal contraception (Roberts et al., 2019). It was found that the risk for depression in postpartum women was elevated with certain hormonal contraceptive use (Roberts et al., 2019). Specifically, use of the arm implant and the vaginal ring were associated with a higher risk for postpartum depression.

In summary, hormonal contraceptive use can negatively alter the brain structure and emotional functioning of women. Women who use hormonal contraceptives are at higher risk of mood-related disorders during and after use. Although there is some research on these correlations, there is a call for more studies. Research on the effects of hormonal contraceptives is necessary so women can make informed decisions regarding their health and well-being.

The Present Study

The purpose of the present study was to investigate the relations between hormonal contraceptive use and women's mood and depressive symptoms. This investigation was focused on college-aged women due to their increased risk for emotional dysfunction and the increased use of hormonal contraceptives from ages 18-24 years old. Although there is not a lot of research on this topic currently, several studies

(Albert et al., 2019; Burrows et al., 2012; Fang et al. 2023; Roberts et al., 2019; Skovlund et al., 2016) do suggest that women's use of hormonal contraceptives is associated with a higher risk for depressive symptoms. It is also important to examine confounding factors that might play a role in the association between hormonal contraceptive use and the reported symptoms, particularly depressive symptoms. One of the possible confounding factors of interest in the present study was whether relationship quality with one's sexual partner might play a role in the association between hormonal birth control use and elevated depression symptoms. A study conducted by Charvat et al. (2023) found that relationship quality has direct and indirect links to mental health and well-being in both males and females, and the results highlighted the importance of high-quality relationships during stressful events. It was also found in this study that negative relationship quality affects women earlier on in the relationship than it does men. Thus, a goal of this study was to investigate whether women's reports of their relationship quality with their sexual partner impact the strength of the relationship between hormonal birth control use and depressive symptoms.

Hypotheses

1. Women using hormonal contraceptives will experience higher depressive symptoms than women who are not using hormonal contraceptives.
2. Women using hormonal contraceptives who also have poor relationship quality are at a higher risk for depressive symptoms.
3. Women who are taking hormonal contraceptives will experience more negative moods and less positive moods in comparison to women who are not on hormonal contraceptives.

METHOD

Participants

The participants in this study were 116 undergraduate students at the University of Maine. These students were recruited from the subject pool of the Department of Psychology and the Department of Communication and Journalism. Out of the 116 participants, 86 met the requirements of being a college student who identified as female between the ages of 18-25 years old and were included in the data set. The sample was 100% female (n=86). Out of the sample of 86, 77 participants (90%) were white, 4 (4.7%) were Asian, 3 (3.5%) were American Indian, 1 (1.2%) was Native Hawaiian/Pacific Islander, and 1 (1.2%) was African American. Of the sample, 42 (48.8%) were 18 years old, 22 (25.6%) were 19 years old, 8 (9.3%) were 20 years old, 6 (7%) were 21 years old, and 2 (2.3%) were 22 years old. The mean age of participants was 18.8 years (SD 1.05 years). Out of the 86 participants, 44 (51%) used hormonal contraceptives and 42 (49%) did not use hormonal contraceptives.

Procedure

Participants were asked to respond to a series of anonymous questionnaires (described below) that were presented online using Qualtrics. Participants were first presented with an informed consent document (see Appendix D). If they chose to proceed with the study, they were then given access to a series of questionnaires. Following submission of their responses, all participants were provided with a list of mental health resources (see Appendix M). Participants were awarded research credit for their involvement in the study.

Measures

Demographic Information. Participants were asked to provide basic demographic information (e.g., age, gender, race; See Appendix E). The demographic information was used to describe the sample and examine for possible group differences.

Mood Assessment. To assess mood, the Positive and Negative Affect Schedule (PANAS; Salas et al., 2014; see Appendix F) was used. This is a 12-item questionnaire designed to assess one's current positive and negative affect (Anger, Anxiety, Sadness) experience. Participants were asked to rate how much each word listed describes how they feel in that moment. Participants were given words such as Happy, Joyful, and Sad, and they were asked to rate how they feel on a scale from 1 (*not at all*) to 5 (*extremely*). For the Positive Affect items, Cronbach's alpha was .587, and for the Negative Affect items, Cronbach's alpha was .619.

Measure of Hormonal Contraceptive Use. This measure was made up of questions curated by the PI to identify if a participant is on a hormonal contraceptive, which one they are on, and why or why not they are on one (see Appendix G). Participants were asked questions such as "Are you currently using a hormonal contraceptive?", "Which hormonal contraceptive are you currently using?", and "How long have you been using this form of contraception?".

Depressive Symptoms. To assess symptoms of depression, the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977; see Appendix H) was administered. The CES-D is a 20-item self-report measure that measures the severity of depression symptoms. Participants were asked to select the option that correlates to how they are feeling or have felt for the prior two weeks in response to a statement. For example, one statement was, "I did not feel like eating; my appetite was poor." and the

participant chose one of the following options 1-4, (1) Rarely or none of the time (less than 1 day), (2) Some or a little of the time (1-2 days), (3) Occasionally or a moderate amount of time (3-4 days), and (4) Most or all of the time (5-7 days). Total scores were used for the scoring of this measure, and a participants score can range from 0-60. The cronbach's alpha was .888 for this measure.

Relationship Quality. To examine the quality of their relationship with their sexual partner (if applicable), participants were asked to respond to the Network of Relationships Inventory: Behavioral Systems Version (NRI-BSV Furman & Buhrmester, 2009; see Appendix I). This questionnaire is a 24-item self-report measure that assesses individual differences in relationship qualities (e.g., support, aggression, dependence, etc.). Participants were asked questions such as "How much does this person turn to you for comfort and support when s/he is troubled about something?" or "How much do you and this person get annoyed with each other's behavior?" and the participant used a rating scale to give their response. This scaled ranged from 1 (*little or none*) to 5 (*the most*) to rate the applicability of the statement to their relationship. Participants (61.6% of the sample, including 79.5% of the group on hormonal contracetive users and 42.9% of the group of non-users) responded to this measure with regard to their romantic partner. Those who did not have a current sexual partner (38.4% of the sample, including 20.5% of the group of hormonal contraceptive users and 57.1% of the group of non-users) were not asked to respond to this measure. For the Positive Affect items, Cronbach's alpha was .967, and for the Negative Affect items, Cronbach's alpha was .908.

RESULTS

The current study was interested in investigating relations between hormonal contraceptive use and emotional functioning in women between the ages of 18-25 years old. Out of the sample of 86, 44 women (51%) were using hormonal contraceptives and 42 (49%) were not using any hormonal contraceptives. Of the 42 not using hormonal contraceptives, 20 (47.6%) reported that their non-use was due to not being sexually active, 2 (4.8%) had religious reasons, 11 (26.2%) were concerned about the psychological effects, 4 (9.5%) used other means of protection/birth control, one (2.4%) could not afford it, and 4 (9.5%) had reasons marked as "other." The "other" responses are as follows: "Went off due to weight gain," "Was using but went off," "Haven't been able to renew," and "Bad reaction to contraceptive disk in the past." For the 44 using hormonal contraceptives, 7 (15.9%) had the IUD, 1 (2.3%) was using the Depo Provera Hormonal Injection, 27 (61.4%) were using the Birth Control Pill, 6 (13.6%) were using the Arm Implant, and the other 3 (6.8%) were using a combination method of some kind. The most common reason that women endorsed using hormonal contraceptives was pregnancy prevention (44.2%). Other reasons included menstrual cycle regulation (39.5% of women) and acne/skincare control (15.1% of women). Independent t-tests were employed in order to analyze possible differences between variables in relation to emotional functioning and hormonal contraceptive use, and correlations among these variables were also conducted and analyzed.

Hormonal Contraceptive Use and Depressive Symptoms

It was hypothesized that women using hormonal contraceptives would experience higher depressive symptoms than women who were not using hormonal contraceptives.

Based on a priori predictions of a direction for the effect (women on contraceptives have higher depression), a one-tailed test was used, and this revealed no differences in depressive symptoms in these groups, $t(84) = .10$, $p = .46$. The effect size was minimal (Cohen's $d = .021$). As shown in Table 1 (see Appendix J), the mean (M) score for depressive symptoms for women using hormonal contraceptives was 42.9 (SD = 11.3), while the mean score for depressive symptoms for women not using hormonal contraceptives was 42.6 (SD = 9.98).

The Association between Relationship Quality and Depressive Symptoms for Women Using vs. Not Using Hormonal Contraceptives

It was hypothesized that women using hormonal contraceptives who also have poor relationship quality are at a higher risk for depressive symptoms. We examined both positive and negative relationship quality results for both groups (hormonal contraceptive users vs. non-users).

For hormonal contraceptive users, the Pearson Correlation Coefficient (r) between positive relationship quality and depressive symptoms was observed to be -.145, indicating a correlation in the hypothesized direction. However, this relationship was not statistically significant ($p = 0.412$, two-tailed). Negative relationship quality was significantly and positively correlated with depression symptoms for women on hormonal contraceptives. The Pearson Correlation Coefficient (r) between negative relationship quality and depressive symptoms for hormonal contraceptive users was observed to be .459, and this relationship was statistically significant ($p = .006$, two-tailed).

For women not using hormonal contraceptives, the Pearson Correlation Coefficient (r) between negative relationship quality and depressive symptoms was -.359,

and this relationship was not significant (p = .143, two-tailed). The Pearson Correlation Coefficient (r) for women not using hormonal contraceptives between positive relationship quality and depressive symptoms was .182, and this relationship was not significant (p = .470, two-tailed).

In addition, independent t-tests were used to examine whether there were relationship quality differences between hormonal contraceptive users and non-users. The mean score (M) for positive relationship quality for hormonal contraceptive users was 53.2 (SD = 16.5), while the mean score for positive relationship quality for women not using hormonal contraceptives was 48.3 (SD = 16.9). A one-tailed t-test revealed that the two groups did not differ in positive relationship quality (PosNRI), $t(50) = 1.02$, $p = .16$. The effect size of this test was observed to be small (Cohen's $d = .296$). The mean score (M) for negative relationship quality for hormonal contraceptive users was 12.9 (SD = 4.95), while the mean score for negative relationship quality for women not using hormonal contraceptives was 12.8 (SD = 3.37). A one-tailed t-test revealed that the two groups did not differ in negative relationship quality (NegNRI), $t(51) = .02$, $p = .493$. The effect size of this test was observed to be extremely minimal (Cohen's $d = .005$).

Mood States in Women Using vs. Not Using Hormonal Contraceptives

It was hypothesized that women who are taking hormonal contraceptives would report experiencing more negative moods (Anger, Anxiety, Sadness), and less positive mood in comparison to women who were not on hormonal contraceptives. Based on a priori predictions of a direction for the effect (women on contraceptives would experience more negative moods and less positive mood in comparison to women who are not on hormonal contraceptives), one-tailed tests were used. Results (see Table 2, Appendix K)

revealed that that two groups did not significantly differ in Anger ($t(83) = .441$, $p = .330$, $d = .096$), Sadness ($t(84) = .251$, $p = .401$, $d = .054$), Anxiety ($t(84) = -1.04$, $p = .151$, $d = -.224$), or Positive mood ($t(84) = 1.90$, $p = .031$, $d = .409$). Therefore, women using hormonal contraceptives did not report experiencing more negative moods, nor less positive mood in comparison to women who are not on hormonal contraceptives. The mean scores for each mood sub scale for hormonal contraceptive users were as follows: Positive Mood (M = 2.73, SD = .668), Sad Mood (M = 2.55, SD = .785), Angry Mood (M = 2.81, SD = 1.20), and Anxious Mood (M = 2.64, SD = 1.39). The mean scores for each subscale for women not using hormonal contraceptives were as follows: Positive Mood (M = 2.44, SD = .753), Sad Mood (M = 2.50, SD = .893), Angry Mood (M = 2.69, SD = 1.21), and Anxious Mood (M = 2.95, SD = 1.36).

Correlations among Depressive Symptoms, Relationship Quality, and Mood for Hormonal Contraceptive Users and Non-Hormonal Contraceptive Users

Finally, correlations among depressive symptoms, positive and negative relationship quality, and the various mood categories were examined separately for hormonal contraceptive users and non-hormonal contraceptive users (see Table 3, Appendix L). For hormonal contraceptive users, depressive symptoms were positively and significantly correlated with sad mood, as well as negative relationship quality. Surprisingly, negative relationship quality was positively associated with positive mood. For non-hormonal contraceptive users, depressive symptoms were positively and significantly correlated with sad mood. For both groups, anger and anxiety mood were positively correlated.

DISCUSSION

The purpose of the present study was to investigate the relations between hormonal contraceptive use and emotional functioning in female college students between the ages of 18 and 25 years old. It was also of interest to determine the percent of college-aged women (ages 18-25 years) who were using hormonal contraceptives and what form of contraceptive they were using. Also explored were the reasons women reported for using or for not using hormonal contraceptives. Interestingly, it was found that about half the sample was using hormonal contraceptives. In comparison to previous research, this percentage is consistent with other findings within similar populations. For example, in a study of women ages 15-34 by Skovlund et al. (2016), 55.5% of the sample used hormonal contraceptives. Women in the present study who reported using hormonal contraceptives most commonly used the Birth Control Pill (61.4%). The second most common form of contraception used in the sample was the IUD (15.9%). The rest of the forms of contraceptives are as follows: The Arm Implant (13.6%), Combination Method (6.8%), and the Depo Provera Hormonal Injection (2.3%). These findings are consistent with previous research in that the use of various forms of contraception was reported, with the Birth Control Pill being the most commonly used form of hormonal contraceptive among women ages 18-25 years old (Roberts et al., 2017; Skovlund et al. 2016). Women reported pregnancy prevention to be the most common reason for using hormonal contraceptives (44.2%). Other reasons included menstrual cycle regulation (39.5% of women) and acne/skincare control (15.1% of women). Women reported not being sexually active as the most common reason for not using hormonal contraceptives (47.6%). The second largest reason was being concerned about the psychological effects

of hormonal contraceptives (26.2%), and the third most common reason was using other means of protection/birth control (9.5%). Other reasons reported were religious reasons (4.8%), could not afford it (2.4%), and 9.5% marked "other reasons" and listed the following reasons: "Went off due to weight gain," "Was using but went off," "Haven't been able to renew," and "Bad reaction to contraceptive disk in the past." These findings are consistent with other research as to why women use hormonal contraceptives, with pregnancy prevention being endorsed as the primary reason women choose to use hormonal contraceptives (Hirth et al., 2022).

Hormonal Contraceptive Use and Depressive Symptoms

The first hypothesis proposed in this study was that women using hormonal contraceptives would experience higher depressive symptoms than women who were not using hormonal contraceptives. The findings of this study did not support a significant link between higher depressive symptoms and hormonal contraceptive use, despite prior research suggesting this association (Albert et al., 2019; Roberts et al., 2017, Skovlund et al., 2016). The lack of significant differences in depressive symptoms between hormonal contraceptives users and non-users suggests that there are other factors that may play a bigger role in determining emotional well-being for this population of young women.

Significant factors that may play a role in determining emotional well-being for women may include stress levels, economic status, alcohol use, smoking, and social capital (Cook et al., 2021). Women are already twice as likely as men to experience depression (Khezeli et al., 2019), and research investigating the intersectionality of these factors and depressive symptoms among hormonal contraceptive users may help us understand emotional functioning for this population of young women.

The lack of a significant difference in depressive symptoms between users and non-users of hormonal contraceptives observed in this study raises important questions about the potential influence of external factors, such as the ongoing COVID-19 pandemic, on emotional functioning in young women. It is possible that the profound and widespread effects of the pandemic may have overshadowed any group differences related to hormonal contraceptive use. A few effects that the pandemic has had on society include, but are not limited to, economic instability, increased social distancing, and increased stress levels globally. It is possible that these factors may have added to depressive symptoms in young women, irrespective of hormonal contraceptive use. Furthermore, the pandemic may have altered the social and interpersonal contexts in which women now navigate relationships in their lives, potentially influencing the observed associations between relationship quality and emotional functioning. Longer periods of isolation and limited social interactions can cause increased feelings of loneliness, impacting emotional functioning. The complexity of the pandemic's effects highlights the need for future research to consider and control for these contextual factors.

Association Between Relationship Quality and Depressive Symptoms

The second hypothesis proposed in this study was that women using hormonal contraceptives who also have poor relationship quality are at a higher risk for depressive symptoms. Although hormonal contraceptive use was not significantly correlated with an increase in depressive symptoms, a positive and significant correlation was found between depressive symptoms and negative relationship quality ($r = .459$, $p = .006$, two-tailed). This means that hormonal contraceptive users that also have negative

relationship quality are at an increased risk of depressive symptoms. Interestingly, this relationship was not observed between these two variables in non-hormonal contraceptive users. Depressive symptoms and negative relationship quality were not significantly correlated for non-users ($r = -.359$, $p = .143$, two-tailed). This implies that the relationship between negative relationship quality and depressive symptoms may differ depending on contraceptive use. This could occur because women who experience poor relationship quality are already at an increased risk for low self-esteem and depression (Khezeli et al., 2019). It has also been found that hormonal contraceptive use has an impact on women's emotional processing, social cue processing, and can cause blunt stress responses and altered brain activation during working memory processing (Mareckova et al., 2014; Ning et al., 2016; Sharma et al., 2020). Hormonal contraceptives have been found to decrease libido in women using them, and this could cause relationship strain. In a systematic review, It was found that hormonal contraceptives had mixed effects on women's libido (Burrows et al., 2012). The combination of these effects for hormonal contraceptive users may explain the significance of the relationship between negative relationship quality and depressive symptoms.

These findings suggest the importance of considering the relationship between hormonal contraceptive use and relationship dynamics in terms of risk of depressive symptoms among young women. Future research could investigate the mechanisms that may be contributing to this correlation, as well as identifying intervention strategies to support women's emotion regulation in the context of hormonal contraceptive use and relationship quality.

Mood States in Women Using Vs. Not Using Hormonal Contraceptives

The third hypothesis presented in this study stated that women who are taking hormonal contraceptives would experience more negative moods and less positive mood in comparison to women who are not on hormonal contraceptives. Contrary to our prediction, the findings of this study did not find evidence for any significant differences in mood states for women using hormonal contraceptives and those who are not using hormonal contraceptives. This suggests that hormonal contraceptive use does not have an association with mood states in this population. However, it should be noted that mood was assessed only once in this study, and this measurement was done while participants were responding to all other measures. This was a relatively emotionally bland context, which might have impacted all participants' mood in the moment, perhaps contributing to similarity in mood across groups. It is possible that in everyday socioemotional functioning, mood differences between the groups may be more pronounced.

Interestingly, previous research has found that women who used hormonal contraceptives have decreased gray matter in their amygdala. This part of the brain is responsible for processing and regulating emotions (Ning et al., 2016). The lack of significant differences in both negative and positive mood states between the two groups in the present study shows the need for further research into the interplay between biological and psychological factors that may contribute to emotional mood states in this population.

Limitations

One of the limitations of this study is the demographic characteristics of the sample. This study's sample included only female college students between the ages of

18-25 years old who were primarily white. This limits the generalizability of the findings of this study to other age groups or demographics. Another limitation regarding the sample was its size. This sample consisted of only 86 women. This restricts statistical power and increases the likelihood of Type II errors like rejecting the hypotheses, in which we may have overlooked subtle but meaningful associations within the dataset. A large limitation to this study was that the focus was only on women in college, which is not representative of the entire population of women in this age group. Unique features of women in college that might limit the generalizability of the findings include their increased level of involvement in sexual activity, their greater access to healthcare, their likely interest in delaying childbearing given their academic goals, and their openness to report on these issues in comparison to older generations. Another limitation of this study was the use of self-report questionnaires. Relying on self-report measures for assessing depressive symptoms, relationship quality, and mood states can cause response bias within the data. For example, even though participants' responses were anonymous, they may have been reluctant to report their sexual relationship status, their negative moods, or their reasoning for using or not using hormonal contraceptives. The anonymity of the responses within the survey was meant to protect participants privacy, but it is speculated that this could have led to unreliability within the responses. It was observed that the data was all over the board, and very randomized at times. Perhaps a non-anonymous study would have garnered more accurate and less randomized answeres, which would made the data more valid and reliable. Lastly, the correlational design of this study does not allow us to draw conclusions regarding causality among any of the variables.

Future Research Directions

Future research could implement multiple different approaches to measure these variables such as clinical interviews or behavioral observations in conjunction with the self-report questionnaires in order to increase validity and reduce bias. In addition, using a longitudinal study approach to analyze these variables over time would provide researchers with the ability to determine causality and analyze more dynamic trajectories within the data. It would be especially interesting to follow women prior to their use of hormonal birth control and then continue to assess their emotions across the first year that they use hormonal birth control.

Future research may benefit from analyzing mediating variables such as stress levels, hormonal fluctuations, and coping mechanisms in order to better understand the relations between hormonal contraceptive use and emotional wellbeing. It would also be beneficial to the study to expand the sample in terms of demographic backgrounds (e.g., socioeconomic status, race/ethnicity, religion), contraceptive methods, and relationship statuses. These inclusions would increase the generalizability of the research.

Future research would benefit from adding more questions in the hormonal contraceptive use section in regard to women's motivations for using or not using hormonal contraceptives. Feelings of shame or fear being associated with one's use or non-use of hormonal contraceptives should be analyzed, as well as pressures from partners to use or not use hormonal contraceptives. This could help to understand whether women are using hormonal contraceptives because they want to, as well as giving researchers a better idea about the definition of relationships and common occurrences within them in regard to hormonal contraceptive use. Further opportunity to define

relationships prior to completing the relationship assessment measure would be useful to researchers in understanding these dynamics as well. This definition would include whether the relationship the participant is in is purely sexual or if it meets emotional and physical needs beyond just sexual relations.

Building on the findings of this study and the interplay of depressive symptoms and associated factors such as hormonal contraceptive use and negative relationship quality, future research could aim to develop intervention strategies to help address these specific needs within this population. The use and reference of health care providers and mental health professionals could be used as an approach to mitigate the impact of negative relationship quality on depressive symptoms in young women who use hormonal contraceptives. This would involve therapists and psychologists working with doctors to implement intervention strategies that help women using hormonal contraceptives become less at risk for depression or bad relationship quality.

Conclusion

In conclusion, while this research did not obtain any significant findings in terms of the associations between hormonal contraceptive use and depressive symptoms or mood states, it does begin to shed light on the complex interplay between individual and contextual factors in regulating emotional functioning among young women. By identifying the limitations above and pursuing further research directions, researchers may be able to create a better understanding of the relationships between hormonal contraceptive use and emotional functioning, as well as create and implement effective intervention strategies that would minimize these associations.

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APPENDECES

Appendix A: IRB Approval

STATUS OF PI: UNDERGRADUATE (F,S,G,U)

If PI is a student, is this research to be performed:

for an honors thesis/senior thesis/capstone.

Submitting the application indicates the principal investigator's agreement to abide by the responsibilities outlined in Section I.E. of the Policies and Procedures for the Protection of Human Subjects.

Faculty Sponsors are responsible for oversight of research conducted by their students. The Faculty Sponsor ensures that he/she has read the application and that the conduct of such research will be in accordance with the University of Maine's Policies and Procedures for the Protection of Human Subjects of Research. REMINDER: if the principal investigator is an undergraduate student, the Faculty Sponsor MUST submit the application to the IRB.

Email this cover page and complete application to umric@maine.edu.

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FOR IRB USE ONLY Application # 2023-09-06 Review (F/E):E Expedited Category:
ACTION TAKEN:

X Judged Exempt; category 2 Modifications required? Yes Accepted (date) 9/28/2023
Approved as submitted. Date of next review: by Degree of Risk:
Approved pending modifications. Date of next review: by Degree of Risk:
Modifications accepted (date):
Not approved (see attached statement)
Judged not research with human subjects

FINAL APPROVAL TO BEGIN 9/28/2023
Date

10/2018

Appendix B: SONA Recruitment

The purpose of this study is to explore mental health in late adolescents, comparing the emotional functioning of females who do vs. do not use hormonal contraceptives (e.g., birth control pills, IUDs, Depo shot, arm implant). You must be a female first-year student who is between 18 and 25 years of age to participate in this study. This study involves responding to anonymous online questionnaires on mood, depressive symptoms, quality of your relationship with your sexual partner (if applicable), and hormonal contraceptive use. This is expected to take up to 60 minutes and you will be awarded 1 research credit.

Appendix C: Informed Consent

You are being asked to participate in a University of Maine research project. The study is being conducted by Shannen Fitzjurls, an undergraduate student in the Department of Psychology and the Honors College, and Dr. Cynthia Erdley, a Professor in the Department of Psychology. The purpose of this study is to learn about the emotional functioning of females who do versus do not use hormonal contraceptives (e.g., birth control pills, IUDs, Depo shot, arm implant). You must be a female that is between 18 and 25 years of age and a first-year student at the University of Maine to participate in this study.

What will you be asked to do?

- This study consists of an online session that may take up to 60 minutes.
- You will be asked to respond to a series of anonymous questionnaires
- You will be asked for demographic information about yourself (e.g., age, race, gender, socioeconomic status).
- You will be asked about your hormonal contraceptive experience and use (e.g.,
- Are you currently on hormonal contraceptives? If so, which one are you currently on?)
- You will be asked to answer questions about your current mood (e.g., I feel alone)
- You will be asked questions about the quality of your relationship with your sexual partner (e.g., How much does this person show support for your activities?), if applicable.

Risks

Some questions may make you feel uncomfortable or distressed. You may skip any question that you do not wish to answer and can elect to end your participation in the

study at any time. Everyone will be provided with a list of mental health resources, and you are encouraged to pursue these options if you are feeling distressed. The UMaine Counseling Center can be reached via phone at 207-581-1392, Monday through Friday, from 8am-4:30pm.

Benefits

There are no direct benefits to you from participating in this study. This research will inform our understanding of the relation of hormonal contraceptive use to mental health outcomes. This knowledge could help females and medical professionals make more informed decisions regarding the use of particular contraceptive methods.

Compensation

You will receive 1 Sona Credit for participating in this study.

Confidentiality

This study is anonymous. Please do not write your name on the survey. There will be no records linking you to the data. Data will be kept on a password-protected computer indefinitely. Information for the Sona credit is not connected to your survey responses.

Voluntary

Your participation in this study is voluntary. You may choose to withdraw from this study at any point and skip any questions that you do not want to answer and still receive credit.

Contact Information

If you have any questions about this study, please email me at shannen.fitzjurls@maine.edu. You may also email the faculty sponsor on this study, Dr.

Cynthia Erdley at erdley@maine.edu. If you have any questions about your right as a research participant, please contact the Office of Research Compliance, University of Maine, 207/581-2657 (or email umric@maine.edu).

By clicking on "Yes; I consent" you indicate that you have read and understood the information

above and consent to participate in this study

__Yes; I consent to participate

__No; I do not consent to participate

Appendix D: Demographics

Age (in years)

What year are you at UMaine?

___First year

___Sophomore

___Junior

___Senior

___Other

Are you a first-generation college student?

___ Yes

___ No

What is your gender identity?

___ Female

___ Male

___ Female-to-male (FTM) Transgender

___ Male-to-female (MTF) Transgender

___ Non-binary

___ Other (please specify)

What is your ethnicity?

___ Hispanic/Latino

___ Not Hispanic/Latino

What is your race?

___African American

___White

___ Asian

___ American Indian

___ Native Hawaiian or Pacific Islander

___ Other (please specify)

Think of this slider as representing where people stand in the United States. On the TOP of the scale (10) are people who are the best off – those with the most money, education, and most respected jobs. At the BOTTOM (1) are the people who are the worst off – those with the least money, education, and least respected of jobs or no job. Where would you place your family as you were growing up on this scale?

Select the number that represents your family.

○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 ○9 ○10

Appendix E: Mood Assessment

Due to PANAS being copyrighted, it could not be included in this document.

Appendix F: Hormonal Contraceptive Usse Questionnaire

Below is a list of questions that inquire about your hormonal contraceptive use and choices. Please select the option that best describes your experience with hormonal contraceptives.

Are you currently using a hormonal contraceptive (e.g., birth control pills, IUD, Depo shot, arm implant)?

-Yes -No

If you are not using a hormonal contraceptive, why not? Please select all that apply.

-I am not sexually active

-I have religious reasons

-I am concerned about the psychological effects

-I use other means of protection/birth control

-I am concerned about cost/can't afford it

-other: please specify

If you are using a hormonal contraceptive, which one are you currently using?

-IUD

-Depo Provera Hormonal Injection

-Birth Control Pill

-Arm Implant

-Other

-If other, please specify below.

How long have you been on this form of contraception?

-Less than six months

-Six months to a year

-One to two years

-More than two years

If you are on a hormonal contraceptive, why are you using it (select all that apply)?

-Pregnancy Prevention

-Menstrual Cycle Regulation

-Acne/Skincare Control

-Other

-If other, please specify below.

Have you ever changed forms of contraception?

-Yes -No

If so, why?

-Negative physical effects

-Negative psychological effects

-Simply did not like it

-Cost

-Other

-If other, please specify below.

Do you wish to change forms of contraception?

-Yes -No

If so, why?

-Negative physical effects

-Negative psychological effects

-Simply do not like it

-Cost

-Other

-If other, please specify below.

Appendix G: CESD

Below is a list of ways you might have felt or behaved in the past two weeks. Please select the number that indicates how you felt or are feeling during the past two weeks.

I was bothered by things that didn't usually bother me.

I did not feel like eating; my appetite was poor.

I felt that I could not shake off the blues even with help from my family and friends.

I felt I was just as good as other people.

I had trouble keeping my mind on what I was doing.

I felt depressed.

I felt that everything I did was an effort.

I felt hopeful about the future.

I thought my life had been a failure.

I felt fearful.

My sleep was restless.

I was happy.

I talked less than usual.

I felt lonely.

People were unfriendly.

I enjoyed life.

I had crying spells.

I felt sad.

I felt that people dislike me.

I could not get “going”.

The above items will be scaled:

○ Rarely or none of the time (less than 1 day)

○ Some or a little of the time (1-2 days)

○ Occasionally or a moderate amount of time (3-4 days)

Most or all of the time (5-7 days)

Appendix H: Relationship History/Quality Questionnaire (NRI-BSV)

Please answer regarding your current sexual partner

Do you have a current sexual partner?

–yes –no

How long have you known one another?

__ years, __ months

How long have you been in a sexual relationship?

__ years, __ months

1.) How much do you seek out this person when you're upset?

1 2 3 4 5

Little or none somewhat very much extremely the most

2.) How much do you turn to this person for comfort and support when you are troubled about something?

1 2 3 4 5

Little or none somewhat very much extremely the most

3.) How much do you turn to this person when you're worried about something?

1 2 3 4 5

Little or none somewhat very much extremely the most

4.) How much does this person encourage you to try new things that you'd like to do but are nervous about?

1 2 3 4 5

Little or none somewhat very much extremely the most

5.) How much does this person encourage you to pursue your goals and future plans?

1 2 3 4 5

Little or none somewhat very much extremely the most

6.) How much does this person show support for your activities?

1 2 3 4 5

Little or none somewhat very much extremely the most

7.) How much does this person turn to you for comfort and support when s/he is troubled about something?

1 2 3 4 5

Little or none somewhat very much extremely the most

8.) How much does this person turn to you when s/he is worried about something?

1 2 3 4 5

Little or none somewhat very much extremely the most

9.) How much does this person seek you out when s/he is upset?

1 2 3 4 5

Little or none somewhat very much extremely the most

10.) How much do you encourage this person to try new things that s/he would like to do but is nervous about?

1 2 3 4 5

Little or none somewhat very much extremely the most

11.) How much do you encourage this person to pursue his/her goals and future plans?

1 2 3 4 5

Little or none somewhat very much extremely the most

12.) How much do you show support for this person's activities?

1 2 3 4 5

Little or none somewhat very much extremely the most

13.) How much do you and this person spend free time together?

1 2 3 4 5

Little or none somewhat very much extremely the most

14.) How often do you and this person go places and do enjoyable things together?

1 2 3 4 5

Little or none somewhat very much extremely the most

15.) How much do you and this person play around and have fun?

1 2 3 4 5

Little or none somewhat very much extremely the most

16.) How much do you and this person get upset with or mad at each other?

1 2 3 4 5

Little or none somewhat very much extremely the most

17.) How much do you and this person disagree and quarrel?

1 2 3 4 5

Little or none somewhat very much extremely the most

18.) How much do you and this person argue with each other?

1 2 3 4 5

Little or none somewhat very much extremely the most

19.) How much do you and this person say mean or harsh things to each other?

1 2 3 4 5

Little or none somewhat very much extremely the most

20.) How often do you and this person point out each other's faults or put each other down?

1 2 3 4 5

Little or none somewhat very much extremely the most

21.) How much do you and this person criticize each other?

1 2 3 4 5

Little or none somewhat very much extremely the most

22.) How much do you and this person hassle or nag one another?

1 2 3 4 5

Little or none somewhat very much extremely the most

23.) How much do you and this person get on each other's nerves?

1 2 3 4 5

Little or none somewhat very much extremely the most

24.) How much do you and this person get annoyed with each other's behavior?

1 2 3 4 5

Little or none somewhat very much extremely the most

Participants will indicate on a 5-point Likert scale the extent to which each statement is true for them regarding their current sexual partner. This measure consists of 24 total items (e.g., "How much does this person show support for your activities?" and "How much do you and this person get upset with or mad at each other?"), 15 of which yield an overall support score, and nine of which yield an overall negative interaction score. Higher scores are interpreted as indicative of greater support and negative interaction within the dyadic relationship, respectively.

Appendix I: Table 1

Table 1: CES-D of Hormonal Contraceptive Users vs. Non-Users

	Hormonal Contraceptive Group Mean (SD)	Non-Hormonal Contraceptive Group Mean (SD)	t-test Results
Depressive Symptoms	42. 9 (11.3)	42.6 (9.98)	$t(84) = .10$, $p = .46$, NS

Depressive Symptoms were measured using the CES-D scale, and total scores could range from 0-60.

Appendix J: Table 2

Table 2: Moods Reported by Hormonal Contraceptive Users vs. Non-Users

	Hormonal Contraceptive Group Mean (SD)	Non-Hormonal Contraceptive Group Mean (SD)	t-test Results
Positive Mood	2.73 (.668)	2.44 (.753)	$t(84) = 1.90$, $p = .031$, NS
Sad Mood	2.55 (.785)	2.50 (.893)	$t(84) = .251$, $p = .40$, NS
Angry Mood	2.81 (1.20)	2.69 (1.21)	$t(83) = .441$, $p = .330$, NS
Anxiety Mood	2.64 (1.38)	2.95 (1.36)	$t(84) = -1.04$, $p = .151$, NS

Positive and negative mood were assessed using the PANAS scale, and average scores on these measures coild range from 1-5.

Appendix K: Table 3

Table 3: Correlations among Depressive Symptoms, Relationship Quality, and Mood for Hormonal Contraceptive Users and Non-Hormonal Contraceptive Users

	CESDtot	Pos NRI	NegNRI	PosMood	SadMood	Angry Mood	Anxiety Mood
CESDtot	–	-.145	.459*	-.098	.354*	.068	-.198
PosNRI	.182	–	.049	-.184	-.108	-.133	-.059
NegNRI	-.359	.209	–	.361*	.239	-.109	.107
PosMood	-.086	.024	-.238	–	-.055	.009	.136
SadMood	.389*	.362	.066	-.135	–	.164	-.048
Angry Mood	-.209	.110	-.196	.122	-.116	–	.337*
Anxiety Mood	-.187	-.459	-.261	-.035	-.131	.376*	–

Note: Hormonal contraceptive users group is presented above the diagonal, and non-hormonal contraceptive users group is listed below the diagonal. Significant correlations are marked with an asterisk, *$p < .05$.

Appendix L: Mental Health Services

Thank you for your participation in this study. Your responses will help us better understand the emotional functioning of females who do vs. do not use hormonal contraceptives. If you are feeling distressed, we encourage you to reach out to one of the counseling services listed below.

Counseling Services

ON-CAMPUS RESOURCES Available for UMaine Faculty, Staff, and Students		
Counseling Center Cutler Health Building (Gannet Hall side) (FREE to UMaine students)	**207-581-1392 http://www.umaine.edu/counseling/**	Weekdays 8:00 am-4:30 pm After business hours, call UMaine Police, 581-4040 or 911
Psychological Services Center 330 Corbett Hall (Sliding fee scale; costs are your responsibility)	**207-581-2034 https://umaine.edu/psychology/psychological-services-center/**	Weekdays 8:00 am – 4:30 pm

COMMUNITY RESOURCES Available to Anyone		
Community Health & Counseling Services 42 Cedar Street Bangor, ME 04401 (Any costs are your responsibility)	**207-947-0366** http://www.chcs-me.org/	Weekdays 8:00 am-5:00 pm
Maine Crisis Hotline (Any costs are your responsibility)	**1-888-568-1112 https://heretohelpmaine.com/**	7 days/week 24 hours
Psychological Services Center 330 Corbett Hall (Sliding fee scale; costs are your responsibility)	**207-581-2034 https://umaine.edu/psychology/psychological-services-center/**	Weekdays 8:00 am – 4:30 pm
Contact Your Primary Care Provider (Any costs are your responsibility)		

NATIONAL RESOURCES
Behavioral Health Services Locator https://findtreatment.samhsa.gov/
National Suicide Prevention Lifeline, Toll-Free, 24-hour Hotline, 1-800-273-TALK (1-800-273-8255)

AUTHOR'S BIOGRAPHY

Shannen Fitzjurls was born in Belfast, Maine on May 20, 2002. She was raised in Stockton Springs, Maine. She moved to Orono, Maine in 2020 to attend the University of Maine. Majoring in Psychology with a concentration in Abnormal Psychology, Shannen has a minor in sociology.

Upon graduating, Shannen plans to remain in Maine working in the realm of psychology before working on an advanced degree in counseling.