

Probiotics can Improve Mood: A Correlational Study Investigating the Relationship between Probiotics and Overall Mental Health

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Abstract

There is evidence that when individuals suffer from indigestion (e.g., acid reflux, Crohn's Disease, or any other stomach related ailment), there is a significant likelihood that those individuals have also experienced various mental health symptoms. According to a national survey completed in 2013 by the National Alliance on Mental Illness, mood disorders are the third most common cause of hospitalization in the U.S. for adults between the ages 18 to 44. Gastrointestinal diseases affect an estimated 60 to 70 million Americans annually. More than 100 trillion bacteria live in our gut and 99% of the DNA in our body is bacterial. A study that was conducted in Ireland found that the mice that were born by caesarean section were significantly more anxious and had symptoms of depression. The inability to pick up their mothers' vaginal microbes during birth may cause lifelong changes in mental health. Probiotics help treat irritable bowel syndrome, infectious diarrhea, some skin conditions, and help to improve digestion and regularity overall. The purpose of this study was to determine whether there is a significant correlation between the use of a daily probiotic and the quality of general mental health. While the main hypotheses for this study were not fully supported, there are significant findings to discuss with regard to mental and physical health, exercise and probiotics.

Keywords: Mental health; Probiotics; Mood disorders; Anxiety; Depression; Psychology; Gastrointestinal health; Psychobiotic; Microbiota

Introduction

Recent studies [1] have shown that there is a link between the efficiency of the digestive system and mental health symptoms such as anxiety and depression [2-4]. There is also evidence that when individuals suffer from indigestion (e.g., acid reflux, Crohn's Disease, or other stomach related ailment), there is a significant likelihood that those individuals have also experienced various mental health symptoms. These symptoms include low mood and anxiety [5-8]. Additional studies [9], and an emerging area in mental health literature, have found that the use of a daily probiotic can improve mood, improve one's overall mental health, and alleviate symptoms that are often linked with depression [3].

By way of a brief history, a probiotic is, "a dietary supplement that contains live bacteria and is taken orally to restore beneficial bacteria to the body" [10]. As this is a recently discovered finding in the mental health literature, there are many gaps, which still require additional research. There are many different strands of probiotics that can be consumed in various forms including common foods, liquid and pill, which makes studying probiotic intake challenging. This study investigated the overall effect of taking a probiotic regularly and its impact on general mental health, as measured through survey research.

Mental health

According to a national survey completed in 2013 by the National Alliance on Mental Illness (NAMI), mood disorders are the third most common cause of hospitalization in the U.S. for adults between the ages 18 to 44 [11]. Another fact to consider is that anxiety and

depression are among the most common psychiatric disorders and are often comorbid [4]. Anxiety and depression are frequent comorbidities in gut disorders, including inflammatory bowel disease (IBD). Individuals with IBD experience 3 times the rate of depression compared with the general population whereby anxiety and depression are estimated to affect 30% of patients with IBD during periods of remission, and as much as 60%–80% of patients during exacerbation of the disease [4].

Recent insights into the role of microbiota in cognitive and affective functioning have led to a theory that probiotics could ameliorate or prevent depression [12]. Intensified cognitive reactivity to normal, temporary changes in sad mood is a recognized marker of vulnerability to depression and is considered an important target for interventions.

Gastrointestinal health

Gastrointestinal diseases affect an estimated 60 to 70 million Americans annually [13]. More than 100 trillion bacteria live in our gut and 99 percent of the DNA in our body is bacterial [14].

The causes of IBD, ulcerative colitis (UC) and Crohn's disease (CD) are unknown; hence, the treatment and diagnosis of said diseases are challenging to say the least. For decades, some clinicians have held the view that IBD and UC may be psychosomatic conditions. It is clear that neurotic symptoms manifest in some patients with IBD, but it is much less clear that neurotic disorders play an etiological part in IBD [15]. In a 2001 study, Kurina and his/her colleagues concluded that the risk of depression or anxiety one year or less before diagnosis with ulcerative colitis suggests that the two psychiatric disorders might be a consequence of early symptoms of the undiagnosed gastrointestinal condition. The findings also suggest that the psychiatric disorders could be etiological factors in some patients with UC. Most of the

excess anxiety or depression diagnosed subsequent to the diagnosis of IBD occurs during the year after IBD is diagnosed and the probable explanation is that the mental disorders are secondary of IBD [15].

Link between gastrointestinal health and mental health

The microbiome is likely to have its greatest impact on the brain early in life [6]. John Cryan at the University College Cork in Ireland, studied mice born by caesarean section, which consisted of different microbes than mice born vaginally and found that the mice that were born by caesarean section were significantly more anxious and had symptoms of depression. The inability to pick up their mothers' vaginal microbes during birth may cause lifelong changes in mental health [6].

It's understood that the stress system is intimately involved in depression. People suffering from major depression frequently have elevated levels of the hormone cortisol, which are released in response to situations causing stress. In a recent study, a probiotic cocktail of *Lactohacillus helveticus* and *Bifido-bacterium longum* was found to reduce cortisol levels [2]. Again we find another implication for the benefit of a daily probiotic.

Probiotics

Probiotics help treat irritable bowel syndrome, infectious diarrhea, some skin conditions, and help to improve digestion and regularity overall. Steenbergen and her colleagues [12] recently found that probiotics may actually aid in improving mood. Probiotics were found to be a good mechanism to fight anxiety or depression, or simply make one feel better [16]. This study consisted of 40 people with no history of mood disorders. Half of the participants consumed a powdered probiotic supplement every night for 4 weeks while the other half of the participants took a placebo. Those who consumed the probiotic supplements began to see improvements in their moods; they reported less reactivity to sad moods than those who took the placebos [12,16]. These results provide the first evidence that the intake of probiotics may help reduce negative thoughts associated with sad mood.

Methodology and design

After obtaining Institutional Review Board approval, participants were recruited. This study used a Correlational statistical design. In order to determine the appropriate sample size for this present study and to have meaningful outcomes, power analyses were conducted. This study's power analysis uses the computer program G*Power and employs Cohen's criteria for effect size. Based on G*Power analyses the number of subjects required for this study is 111. The purpose of this study was to determine whether there is a significant correlation between the use of a daily probiotic and the quality of general mental health. In recent years, there have been few studies investigating the impact of probiotics and its effect on gastrointestinal health [9].

The instruments used to conduct this study were surveys, which included a general measure of mental and physical health, demographics, probiotic use, and a DSM-5 Self-Rated Level 1 Cross-Cutting Symptom Measure for Adults. These surveys were administered to participants 18 and older through Survey Monkey and each participant's results were kept confidential. Participants consisted of a convenience sample of 157 male and female whom were recruited through online listservs and social media.

Results

Participants (n=157) were primarily female (76.4%) with the most common ages in the range of 21-29 (39.5%). The majority of the participants were White (80.3%). While 91.7% of the sample knew what a probiotic was, only 24.2% reported that that consumed a probiotic daily, even though 54.8% had taken a probiotic within the past month. Preliminary analyses indicated few significant relationships between mental health questions and probiotic usage. Explanation for this lack of finding is explained in the Discussion section.

There was a significant finding regarding mental health and exercise, which is widely known and accepted to be an effective treatment for those with mental health issues. There was a significant finding between those endorsing mental health distress and the importance of exercise at the 0.307 level ($p < 0.01$). This finding, although not directly a part of our hypotheses, supports the efficacy of physical exercise and improving mental health [17]. Our participants were educated about the importance of physical exercise when feeling mental health distress.

Discussion

While the main hypotheses for this study were not fully supported, there are still significant findings to discuss with regard to mental and physical health, exercise and probiotics. First, a large portion of the sample (91.7%) were familiar with probiotics and more than half (54.8%) had even taken one in the past month. As clinicians working in diverse settings (e.g., Nutritionist, Dieticians, Psychologists, Nurses), one of our many roles is to educate the client. This education is critical as we begin to explore and understand more about the relationship between probiotics and mental health. While we could not statistically determine a significant relationship between mood and probiotic intake, there is compelling evidence as seen in Steenbergen and her colleagues and Bushak who reported that probiotics may actually aid in improving mood, and to reduce symptoms of anxiety or depression, respectively. We certainly conclude that more research is needed in this area. Lastly, our results support the complexity of treating mental health symptoms whereby treating the whole person is crucial. It would not be simple enough to suggest the intake of a probiotic, alone, could combat mental health issues. We realize that it requires the interdisciplinary approach including mental health professionals, primary care physicians, and those in the dietetic and nutrition world.

There are several limitations to this study that have had an impact on our findings. The first is the difficulty in measuring general mental health through survey research. We used the DSM-5 Self-Rated Level 1 Cross-Cutting Symptom Measure for Adults. In terms of probiotic, we also asked about the consumption of many foods that contain probiotics such as, Kombucha tea, dark chocolate, miso soup, pickles etc. We believed that people might be ingesting probiotic without knowing they were. Consequently, this added to the question total, which could have been distracting, and we also believe that many participants may not have known some of the food choices (e.g., Poi, Natto, Kimchi, Tempeh, Kefir).

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