

# Best Diet For Mood Update 2023

*Austin Coleman, David Puder, MD*

Neither of the authors have any conflicts of interest

In today's episode of the podcast, we will explore the significant connections between our dietary choices and our mental well-being. We will discuss practical steps to incorporate diet as part of mental health treatment and maintenance. This episode is the perfect starting point to discover how nutrition can play a role in supporting mental wellness, whether it is new information or an enhancement of current approaches.

Based on a comprehensive review of the latest research regarding diet and mental health, evidence suggests that a crucial first step in improving emotional well-being involves eliminating ultra-processed foods from our diets. [A notable study in 2022 by Lane et al.](#), employing a systematic review and meta-analysis approach, delved into the connection between the consumption of processed foods and mental health disorders. Their findings shed light on the significant impact these foods can have on psychological well-being.

## Depression

A comprehensive analysis of eight studies was conducted, involving a total of 102,005 participants. Among these studies, two were prospective in design, carried out in Spain (n = 14,907) and France (n = 26,730). From the prospective studies, a significant association was found between higher consumption of ultra-processed foods and an increased risk of developing depression or experiencing depressive symptoms, with a hazard ratio of 1.22 (95%CI 1.16 to 1.28, p < 0.001, I<sup>2</sup> = 0%), based on a sample size of 41,637 individuals. Additionally, six cross-sectional studies were analyzed, with three of them included in a separate meta-analysis involving 15,555 participants. This meta-analysis demonstrated a higher likelihood of depressive symptoms associated with greater consumption of ultra-processed foods, with an odds ratio of 1.44 (95%CI 1.14 to 1.82, p = 0.002, I<sup>2</sup> = 0%). Importantly, the main findings remained consistent even after conducting sensitivity analyses.

## Anxiety

Six cross-sectional studies involving a total of 205,146 participants were analyzed. Among these studies, three were included in a meta-analysis with a sample size of 101,709 individuals. The meta-analysis revealed a significant association between higher consumption of ultra-processed foods and increased odds of experiencing anxiety symptoms. The odds ratio was 1.48 (95%CI 1.37 to 1.59, p < 0.001, I<sup>2</sup> = 0%).

There were even more studies conducted looking at symptoms of depression and anxiety together. Five cross-sectional studies involving a total of 185,773 participants were analyzed.

# Best Diet For Mood Update 2023

*Austin Coleman, David Puder, MD*

The results revealed a significant link between higher consumption of ultra-processed foods and increased odds of experiencing depressive and anxiety symptoms. The odds ratio was 1.53 (95%CI 1.43 to 1.63,  $p < 0.001$ ,  $I^2 = 8.9\%$ ).

But which comes first? The processed foods or the problems with mental health? The short answer—more research is needed. Most of the studies within this review were cross-sectional, so determining the directionality of the relationship between the food and mental health was admittedly restricted.

## What are processed foods?

The authors defined “ultra-processed food” using the NOVA food classification system. “NOVA distinguishes ultra-processed foods as industrial formulations generated through compounds extracted, derived or synthesized from food or food substrates. Ultra-processed food items are characterized as containing five or more ingredients, which typically include artificial food additives rarely or never used in home kitchens (e.g., preservatives, colors, texturizing agents, and olfactory and taste enhancers). These food items are frequently low-priced, convenient, shelf-stable, easily consumed and highly palatable.”

- **Preservatives:** These are added to prolong shelf life. Examples include sodium nitrate, sodium benzoate, and sulfites.
- **Sweeteners:** Both artificial and natural sweeteners are used to improve the taste. Examples include high fructose corn syrup, aspartame, sucralose, and saccharin.
- **Artificial colors:** These are used to make the food look more appealing. Examples include Red #40, Yellow #5, and Blue #1.
- **Artificial flavorings:** These are used to enhance or mimic natural flavors. Examples include monosodium glutamate (MSG) and artificial vanilla (vanillin).
- **Texturants:** These are used to give foods a specific texture or consistency. Examples include carrageenan, xanthan gum, and guar gum.
- **Emulsifiers:** These help mix ingredients together that would normally separate, like oil and water. Examples include soy lecithin and mono- and diglycerides.
- **Acidulants:** These are used to control the acidity and pH of foods. Examples include citric acid and vinegar.
- **Hydrogenated oils:** These are used to improve shelf life and create a specific texture. They can also create trans fats, which are harmful to health.
- **Stabilizers:** These prevent ingredients from separating. Examples include pectin and agar-agar.
- **Humectants:** These are used to keep foods moist. Examples include glycerin and propylene glycol.

# Best Diet For Mood Update 2023

*Austin Coleman, David Puder, MD*

## What types of foods are these commonly in?

Ready-to-eat and ready-to-heat meals:

- Instant noodles and soups
- Frozen pizza and microwave meals
- Canned stews and pasta dishes

Sugary snacks and desserts:

- Packaged cakes and cookies
- Candy and chocolate bars
- Ice cream and other frozen desserts

Beverages:

- Soda and other sweetened drinks
- Packaged fruit juices and fruit drinks
- Energy drinks and pre-made coffee or tea beverages

Processed meats and alternatives:

- Hot dogs, sausages, and deli meats
- Chicken nuggets and fish sticks
- Meat substitutes with a high level of processing

Convenience foods and snacks:

- Chips, pretzels, and other salty snacks
- Packaged "lunch kits" with crackers, cheese, and processed meats
- Pre-packaged meals like boxed macaroni and cheese or hamburger helper

## What does it say about the nutritional value of these foods?

The authors of this meta-analysis addressed this very question, stating, “although NOVA largely ignores the nutritional composition of food in its classification process, many ultra-processed foods are sources of high energy, refined starches, sugar, sodium and saturated and trans-fats. Ultra-processed foods also typically lack the various fibers, polyphenols, omega-3 fatty acids and essential vitamins and minerals of non-ultra-processed foods such as vegetables, fruits, legumes, wholegrains, fatty fish, lean meats, nuts and seeds and others. These nutrient-poor profiles have been implicated in the prevalence, incidence and severity of depression through a number of interacting pathways, including inflammation, oxidative stress and the gut microbiome.”

It appears there are multiple mechanisms by which ultra-processed foods could potentially harm our mental health. These hypotheses include mechanisms of inflammation, oxidative stress, alterations in the gut microbiome, as well as the interference of specific chemicals with neurotransmitter synthesis and release. While the precise details are still being investigated, one thing is evident: these foods are associated with a negative impact not only on our physical health but also on our mental well-being.

# Best Diet For Mood Update 2023

*Austin Coleman, David Puder, MD*

Encouraging individuals to prioritize a predominantly plant-based diet consisting of whole, unprocessed foods is indeed a beneficial recommendation for improving mental health. However, it is important to identify specific food properties that may have a negative impact. What can we specifically try to avoid if we want to take steps to improve our mental health through diet?

Enter our next study—the HELIUS (Healthy Life in an Urban Setting) study. In this study, conducted by Vermeulen et al., a sub-sample of participants was taken from the original HELIUS study, which was a large prospective cohort study focusing on the social determinants of disease burden in a diverse population in Amsterdam. The sub-sample consisted of 4,969 individuals aged 18-70 years. The participants were assessed for depressive symptoms using the PHQ-9 based on their belonging to one of three different dietary patterns: High-Sugar (characterized by high consumption of sugary beverages, fruit juices, added sugars, and low intake of red meats and fats), High-Saturated-Fat (characterized by high consumption of butter, high-fat dairy, and low intake of nuts, seeds, and vegetables), or High-Sugar High-Saturated-Fat (characterized by high consumption of sweets, red meats, high-fat dairy products, creams, and fried foods). The study also took into account various demographic and lifestyle factors such as age, sex, ethnicity, marital status, employment status, physical activity, smoking status, as well as health-related variables including energy intake, BMI, prevalent cardiovascular disease (CVD), hypertension, and type 2 diabetes. The participants had an average BMI of 26.7 kg/m<sup>2</sup> and an average depressive symptoms score of 5. The study found that when comparing the highest and lowest quartiles, consuming a High-Sugar High-Saturated-Fat (HSHF) dietary pattern was associated with more depressive symptoms (Q1 vs. Q4:  $\beta=0.18$ , 95% CI 0.07, 0.30,  $p=0.001$ ) and higher odds of depressed mood (Q1 vs. Q4: OR=2.36, 95% CI 1.19, 4.66,  $p=0.014$ ). However, no significant associations were observed between the other dietary patterns and depressive symptoms. It is intriguing to note that while the High-Sugar and High-Saturated-Fat dietary patterns individually did not show a significant impact on depressive symptoms, their combined effect appears to be significant. These two distinct nutrient groups seem to synergistically contribute to a negative emotional state.

So, in trying to change diet to improve mental health, the implication is to stay away from highly processed food, such as those high in sugar and saturated fat.

## What kinds of foods are best for improving mental health?

The short answer is foods that fall under the large umbrella of “The Mediterranean Diet.” There are a few studies that back this up.

This first study, the SMILES trial by Jacka et al. in 2017, was a major landmark in the world of nutritional psychiatry and has been widely cited (even in this podcast). The SMILES trial, a pioneering randomized-controlled trial, examined the impact of food on depression. This

# Best Diet For Mood Update 2023

*Austin Coleman, David Puder, MD*

12-week study involved 67 participants divided into two groups: a dietary intervention group and a control group. The dietary intervention group received nutritional consulting sessions aimed at promoting the consumption of whole grains, vegetables, fruits, legumes, low-fat and unsweetened dairy foods, raw and unsalted nuts, fish, lean red meats, chicken, eggs, and olive oil. Conversely, they were advised to reduce their intake of foods such as sweets, refined cereals, fried foods, fast-food, processed meats, and sugary drinks. Additionally, participants in the dietary intervention group were provided with a food hamper. Meanwhile, the active control group participated in social support sessions consisting of befriending activities such as discussions on shared interests and playing games. The social support sessions were of equal length and frequency as the nutritional consulting sessions in the diet group.

Both the dietary intervention group and the control group were recruited based on their initial poor dietary habits, as confirmed by a score of 75 or less on the Dietary Screening Tool. The primary scale used to assess the outcomes of each group was the Montgomery-Asberg Depression Rating Scale (MADRS). The MADRS is a widely recognized scale that measures depressive symptomatology through 10 items rated on a 6-point scale, with a maximum possible score of 60. Higher scores on the MADRS indicate a higher severity of depressive symptoms. In this study, remission was defined as a MADRS score below 10, indicating a significant reduction in depressive symptoms. The study concluded with remarkable findings, showcasing the significant impact of moderate dietary changes on depression treatment. Among the dietary intervention group (n=31), an impressive 32.3% achieved remission from depression, while only 8% in the control group (n=25) experienced the same outcome. This highlights the positive effect of dietary modifications in combating depression. Specifically, the average reduction in MADRS scores was 7.1 points greater in the diet group compared to the control group. This significant difference was supported by a Cohen's d effect size of -1.16 (95% CI -1.73, -0.59,  $p < 0.001$ ), indicating a substantial improvement in depressive symptoms as a result of the dietary intervention. Notably, the observed mood improvement was not attributed to weight loss, as there were no significant changes in participants' weight throughout the study. Instead, the quality of food consumed played a crucial role.

The dietary intervention group made specific adjustments to their diet, including a notable increase in whole grains by 1.2 servings per day, fruit intake by 0.46 servings per day, dairy consumption by 0.52 servings per day, and olive oil intake by 0.42 servings per day. Additionally, they incorporated 1.4 more servings per week of chickpeas, garbanzo beans, peas, and lentils, as well as 1.12 more servings per week of fish. Moreover, unhealthy food consumption decreased by 21.76 servings per week. These findings highlight the importance of dietary modifications, emphasizing the potential for improving depressive symptoms without relying solely on weight loss but rather focusing on the quality and composition of the food consumed.

An intriguing aspect of the study was the evaluation of costs, considering the common belief that a healthier diet tends to be more expensive. The researchers discovered that, initially, participants spent an average of AU\$138 per week on food and beverages for personal

## **Best Diet For Mood Update 2023**

*Austin Coleman, David Puder, MD*

consumption. However, the recommended diet in the intervention group resulted in an average cost of AU \$112 per week per person, making it AU \$26 cheaper per week (\$18 when converted to US dollars at the time of this writing). This finding challenges the notion that adopting a healthier diet is financially burdensome, suggesting that it is possible to follow a nutritious eating plan without incurring significantly higher costs. By demonstrating a more affordable dietary approach, the study provides valuable insights for individuals who may have concerns about the financial feasibility of adopting healthier eating habits.

# Best Diet For Mood Update 2023

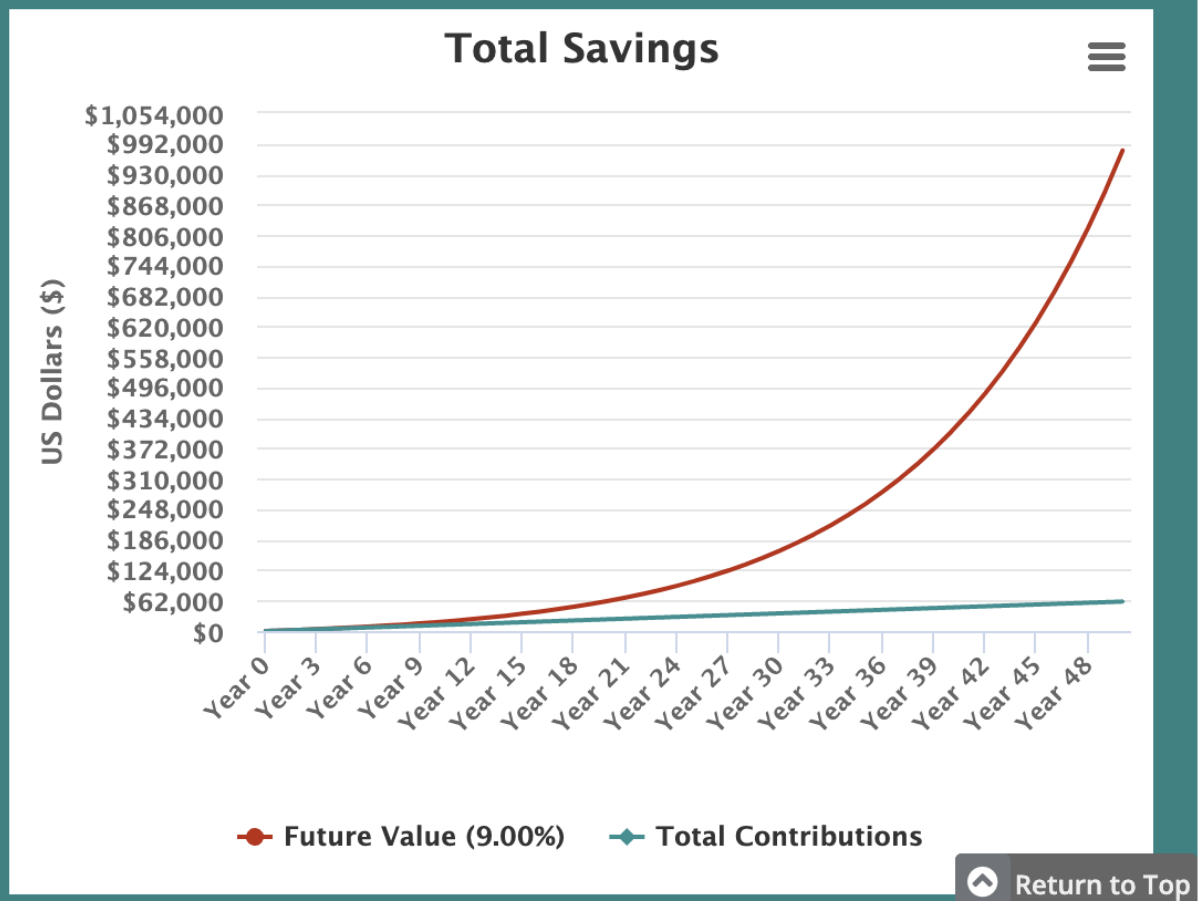
Austin Coleman, David Puder, MD

## The Results Are In

In **50** years, you will have **\$978,100.27**

The chart below shows an estimate of how much your initial savings will grow over time, according to the interest rate and compounding schedule you specified.

Please remember that slight adjustments in any of those variables can affect the outcome. Reset the calculator and provide different figures to show different scenarios.



[SHOW TABLE](#)

# Best Diet For Mood Update 2023

Austin Coleman, David Puder, MD

## Recent Studies (within the past 6 years) That Support the 2017 SMILES Trial

Our first focus will be on the HELFIMED study, a 2017 study conducted by Parletta et al. It investigated the effects of a Mediterranean-style dietary intervention, combined with fish oil supplementation, on improving diet quality and mental health in individuals with depression. This study included a total of 152 participants aged 18 to 65 with diagnosed depression or self-reported depressive symptoms within the past 2 months (participants that self-reported depression were included if they were in the moderate to extremely severe depression range according to the Depression Anxiety Stress Scale (DASS-21)).

DASS (42) Scoring	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely Severe	28+	20+	34+

It is worth noting that participants were requested to continue their existing depression treatment and were instructed not to initiate any new treatment during the study. These participants were divided into two groups: the MedDiet group (75 individuals at onset, 54 at 3 months, 47 at 6 months) and the social group (77 individuals at onset, 41 at 3 months, 38 at 6 months). The MedDiet group received daily fish oil capsules containing 450 mg of DHA and 100 mg of EPA. They also attended nutrition education and cooking workshops every 2 weeks for a duration of 3 months. These sessions focused on preparing simple and affordable recipes using Mediterranean-style foods. Following each workshop, the MedDiet group received the recipes and ingredients for the foods they learned to cook, as well as additional online and printed resources for ongoing support. In contrast, the social group participated in social sessions held every 2 weeks for the duration of 3 months. These sessions involved activities such as playing games, sharing meals, participating in book clubs, and forming social connections and friendships.

In terms of the study's results, the primary outcome measures used were the DASS-21 (which was also utilized for inclusion criteria) and the Assessment of Quality of Life (AQoL)-8D scores. After 3 months, both the MedDiet group and the social group showed significant improvements in mental health based on these measures. However, the MedDiet group exhibited a greater reduction in depression (as evidenced by a significant t-value of -2.24,  $p = 0.03$ ) and



# Best Diet For Mood Update 2023

Austin Coleman, David Puder, MD

demonstrated improved mental health quality of life scores (with a significant t-value of 2.10,  $p = 0.04$ ). Mean DASS-21 scores for the MedDiet group were 23 (SD 1.10) at baseline, 12.63 (SD 1.26) at 3 months whereas the social group was 21.79 (SD 1.08) baseline and 15.94 (SD 1.45) at 3 months -> This is a reduction in DASS scores of 10.37 in the MedDiet group compared to a reduction of 5.85 in the social group, a difference of 4.52.

These positive changes were sustained even at the 6-month evaluation mark. In terms of dietary changes, the MedDiet group demonstrated significant improvements compared to the social group. Specifically, the MedDiet group consumed significantly higher amounts of vegetables, fruit, nuts, legumes, and whole grains. On the other hand, they consumed fewer unhealthy foods such as burgers, chips, and pizza, as well as less red meat and chicken. This study suggests that adopting a Mediterranean-style diet, supplemented with fish oil, can effectively reduce depressive symptoms and improve mental health. The findings support the findings of the SMILES trial and demonstrate that the positive effects of dietary changes can persist for up to 6 months.

In another 2019 study conducted by Francis et al., the researchers targeted young adults aged 17 to 35 who were diagnosed with depression (score greater than or equal to 7) using the Depression, Anxiety, and Stress Scale -21 Depression subscale (DASS-21D) assessment tool and had a poor diet as determined by the Dietary Fat and Sugar Screener.

	Depression	Anxiety	Stress
Normal	0 - 4	0 - 3	0 - 7
Mild	5 - 6	4 - 5	8 - 9
Moderate	7 - 10	6 - 7	10 - 12
Severe	11 - 13	8 - 9	13 - 16
Extremely Severe	14 +	10 +	17 +

The study comprised 38 participants in each group and both groups continued to adhere to any ongoing treatment or therapy they were receiving. The diet change group received online video instructions aimed at increasing the consumption of foods aligned with the Mediterranean diet, which included omega-3 fatty acids, vegetables, fruits, whole grains, legumes, unsweetened dairy products, fish, nuts/seeds, and olive oil. Simultaneously, they were advised to decrease the intake of poor-quality foods such as refined carbohydrates, sugar, fatty/processed meats, and soft drinks. The participants in this group were provided with meal plan samples, recipes, a small hamper of food items, and they also received a \$60 food reimbursement. Aside from instruction, the diet change group received 5-minute phone calls on Day 7 and Day 14. These calls aimed to inquire about any difficulties the participants were experiencing in adhering to the prescribed diet and to address any challenges by referring to the provided handouts. On the other hand, the control group received no specific instructions regarding dietary changes and

# Best Diet For Mood Update 2023

*Austin Coleman, David Puder, MD*

were simply asked to return after three weeks. This time frame of three weeks was chosen to mimic the typical time course of antidepressant effects.

The primary outcome measure utilized in the study was the evaluation of depression symptoms using the CESD-R (Center for Epidemiological Studies Depression Scale - Revised) score. The average CESD-R score for the diet change group showed improvement, transitioning from the elevated range to the range of no clinical significance (scores <16). On day 21, the diet change group exhibited significantly lower CESD-R scores compared to the control group when controlling for baseline CESD-R scores ( $F[1,75] = 7.792$ ,  $p = .007$ , Cohen's  $d = 0.65$ ). Diet change group went from 20.56 to 14.62 on day 21 (change of -5.94), whereas the habitual diet group went from 20.28 to 20.81 (change of + 0.53) -> Difference of 6.47. Notably, even after further adjusting for variables such as age, gender, physical activity, and baseline BMI in an additional analysis (ANCOVA), the significant difference between the groups at day 21 persisted ( $F[1,71] = 7.091$ ,  $p = .010$ ). In addition to the CESD-R score, a secondary outcome measure was utilized to assess depressive symptoms in the study. The DASS-21 (previously used to screen participants) score was employed for this purpose.

The findings revealed that the diet change group exhibited improvement in DASS-21 scores, transitioning from the range of moderate severity to the range of normality. In contrast, the control group's DASS-21 scores remained relatively stable within the moderate severity range across baseline and day 21. On day 21, the diet change group demonstrated significantly lower DASS-21-Depression scale scores compared to the control group, while controlling for baseline DASS-21-Depression scores ( $F[1,75] = 10.104$ ,  $p = .002$ , Cohen's  $d = 0.75$ ). Diet change group went from 7.18 to 4.37 on day 21 (change of -2.81), habitual group went from 7.03 to 6.59 on day 21 (change of -0.44) -> difference of 2.37. This significant improvement at day 21 remained even after adjusting for variables such as age, gender, physical activity, and baseline BMI through an additional analysis using ANCOVA ( $F[1,71] = 8.165$ ,  $p = .006$ ).

Furthermore, participants' adherence to the recommended dietary changes was assessed using the Diet Compliance Score, which is a 10-item questionnaire specifically developed for this study that asked participants about how many servings of the recommended foods they ate over the course of the study. The study revealed a significant increase in the consumption of recommended foods within the diet change group compared to the control group ( $F(1, 75) = 122.786$ ,  $p = .000$ , Cohen's  $d = 2.58$ ). This indicates that participants in the diet change group successfully increased their intake of foods aligned with the intervention's guidelines. Additionally, the diet change group demonstrated a significant reduction in the consumption of foods high in saturated fat and refined sugar, as assessed by the Dietary Fat and Sugar Screener utilized earlier in the study, when compared to the control group ( $F(1, 75) = 51.969$ ,  $p = .000$ , Cohen's  $d = 1.67$ ).

The findings of this study have several implications. Firstly, they provide further support for the claims made by the previous SMILES trial and HELIUS study, as the current study

# Best Diet For Mood Update 2023

Austin Coleman, David Puder, MD

demonstrates that depressive symptoms significantly improved (with a moderate effect size) through increased consumption of Mediterranean-style foods and a decrease in foods high in saturated fat and refined sugar. Secondly, the study offers a unique perspective by showing that significant results can be achieved in as little as 21 days, whereas the previous SMILES trial ran for 12 weeks. This highlights the potential for relatively rapid improvements in depressive symptoms through dietary changes. Furthermore, the study indicates that these positive effects can have lasting impacts, as demonstrated by the three-month follow-up. The DASS-21 depression scores remained significantly lower than baseline, suggesting the maintenance of intervention effects.

The most recent study to highlight is the [AMMEND study by Bayes et al. \(2022\)](#), which investigates the impact of a Mediterranean diet intervention on the treatment of depression, focusing specifically on young males. This study included 72 male participants aged 18-25 who had a previous diagnosis of depression, scored in the moderate to severe range (score over 20) on the Beck Depression Inventory II (BDI-II), and were found to have a poor diet according to the Commonwealth Scientific and Industrial Research Organization (CSIRO) Diet Survey.

Total Score _____	Levels of Depression
1-10 _____	These ups and downs are considered normal
11-16 _____	Mild mood disturbance
17-20 _____	Borderline clinical depression
21-30 _____	Moderate depression
31-40 _____	Severe depression
over 40 _____	Extreme depression

An interesting aspect of this study is the collection of data regarding the participants' existing treatments for depression. Out of the total participants, 45% (n = 33) were seeing a psychologist and 35% (n = 26) were taking medication for their depression. It is noteworthy that despite differences in treatment, all participants, whether receiving treatment or not, had similar baseline depression scores. Among those receiving treatment, the average length of treatment was 1 year for medications and 8 months for psychotherapy.

These participants were then divided into two groups: the Mediterranean Diet Group and the Befriending Group. The participants in the diet group had hour-long appointments with a clinical nutritionist. During these sessions, the nutritionist employed motivational interviewing techniques, provided personalized dietary advice, and collaboratively set goals with the participants to adhere to the Mediterranean diet. The participants were advised on recommended servings of various food groups within the Mediterranean diet, such as whole grains, vegetables, fruits, legumes, nuts/seeds, dairy, fish, red meat, eggs, and limits on sweets, fried foods, processed meats, and sugary drinks. Similar appointments were scheduled at

# Best Diet For Mood Update 2023

*Austin Coleman, David Puder, MD*

weeks 6 and 12 of the study, and the participants also received additional resources including meal plans, recipes, budgeting tips, and daily diet surveys. Furthermore, they were given a food hamper containing \$50 worth of Mediterranean foods. Participants in the Befriending Group received supportive befriending sessions of the same duration and schedule as the nutritionist appointments. These sessions aimed to provide emotional support and companionship. In addition, participants in the befriending group received a \$50 gift card as a token of appreciation for their participation in the study.

The study had a duration of 12 weeks, similar to the SMILES trial and the HELFIMED study. The primary outcome measure for depression in this study was the BDI-II, which was used in the inclusion criteria. Both the Mediterranean Diet Group and the Befriending Group had similar BDI-II scores at baseline (mean of 34.8 for Diet and 33.5 for Befriending). However, by week 12, both groups experienced a decrease in BDI-II scores. The diet group showed a mean change of 20.6 (95% CI: 17.08, 24.33), while the befriending group had a mean change of 6.2 (95% CI: 1.83, 10.57). The mean difference in BDI-II scores between the diet group and the befriending group at week 12 was 14.4 (95% CI: 11.41, 17.39), which was statistically significant ( $P < 0.001$ ). Amazingly, by the end of the study every participant in the diet group showed improvement in their symptoms, with 12 of them (36%) reporting BDI-II scores in the low or minimal depression range.

As with the previous trials we have discussed, adherence to the diet protocol was also assessed using the Mediterranean Diet Adherence Score (MEDAS), which was similar for both the diet and befriending groups at baseline.

Over the course of the study, the Diet Group showed a mean change in MEDAS of 8.0 (95% CI: 7.41, 8.59), while the Befriending Group had a mean change of 0.2 (95% CI: -0.27, 0.67). The mean difference in MEDAS between the Diet Group and the Befriending Group at week 12 was 7.8 (95% CI: 7.23, 8.37;  $P < 0.001$ ). This study provides further support for the benefits of dietary interventions in improving depressive symptoms. It demonstrates that even with a relatively low number of appointments or interventions, significant improvements in diet and depressive symptoms can be achieved. In contrast to previous studies such as the SMILES trial and the HELFIMED study that involved 7 nutritional counseling appointments, this study showed positive outcomes with only 3 counseling sessions.

Therefore, it suggests that effective dietary interventions for depression may not always require extensive interventions and can be implemented in a more streamlined manner. It would have been truly remarkable and uplifting for a participant who had been utilizing medication or psychotherapy for an extended period to experience a significant reduction in depressive symptoms by incorporating a dietary intervention. This outcome not only underscores the potential of diet as a complementary treatment approach but also instills hope and opens up new possibilities for managing depression. By combining conventional treatments with dietary

# Best Diet For Mood Update 2023

*Austin Coleman, David Puder, MD*

modifications, a holistic and personalized approach can be established, leading to improved mental well-being and enhanced overall quality of life for individuals struggling with depression.

In summary, these three studies provide valuable insights to build upon the findings of the SMILES trial:

- 1) Diet can successfully be modified without requiring intensive or regular nutrition consultation. The inclusion of meal plan samples and online video instructions in the brief diet intervention study demonstrates that individuals can make effective dietary changes with accessible resources.
- 2) Changes in diet can yield mental health benefits in a relatively short period. The observed improvements within 21 days highlight the potential for rapid positive effects on mental well-being through dietary interventions.

It sounds pretty clear that, when it comes to improving mental health through diet, the data points to increasing consumption of Mediterranean-style foods (fruits, vegetables, whole grains, legumes, nuts/seeds, heart-healthy fats) and decreasing the consumption of processed foods, foods high in saturated fat and high in sugar.

## Are there any other foods with notable data in improving mental health?

The role of prebiotics, probiotics, and synbiotics in the context of the gut microbiome and its impact on mental health is a topic of great interest. Addressing this question, we turn to the "Gut Feelings" trial conducted by [Freijy et al. in February 2023](#). This groundbreaking randomized controlled trial is among the first of its kind to examine the effects of these biotics on mental health.

The study recruited 119 participants, aged 18-65, who were specifically selected based on criteria such as psychological stress, low prebiotic fiber intake, and no recent use of fermented/prebiotic products, antibiotics, PPIs, NSAIDs, psychotropic medications, or immunosuppressants. Participants were divided into the following groups based on the interventions they received: the probiotic group (n=30), the prebiotic diet group with placebo supplement (n=28), the synbiotic group containing prebiotic diet with probiotic supplement (n=32), and the placebo group (n=28). All participants were instructed to abstain from consuming fermented foods and using probiotic supplements for a period of 2 weeks prior to the start of the study. This restriction on fermented foods and probiotics was maintained throughout the entire 8-week study period. All groups were instructed to take capsules twice daily, one capsule in the morning and one in the evening (with food), for a duration of 8 weeks. (It is important to note that the placebo capsules and the probiotic capsules were indistinguishable in terms of appearance, taste, and texture.)

# Best Diet For Mood Update 2023

*Austin Coleman, David Puder, MD*

Participants assigned to the prebiotic diet group were given specific instructions to consume seven or more servings per day of prebiotic-rich foods. This included foods such as watermelon, whole wheat, chickpeas, onion, oats, garlic, and asparagus. The aim was to ensure an adequate intake of dietary prebiotic fibers. The participants in the diet group were provided with examples of high-prebiotic foods and received a hamper containing these foods to kickstart their adherence to the prebiotic diet. They were also given an instructional video that outlined the specifics of the prebiotic diet and provided guidance on incorporating these foods into their daily meals. In contrast, the participants in the non-diet groups watched a video that focused on their assigned supplements and provided information about the overall study design. The primary outcome measure was the total mood disturbance (TMD) score, assessed using the Profile of Mood States Adult Short Form, 2nd edition (POMS 2-SF). The POMS 2-SF is a self-report questionnaire that measures psychological distress experienced over the past week. A decrease in TMD score indicates an improvement in mood, as higher values reflect more negative mood states.

At the end of the 8-week study, there was moderate evidence indicating that the prebiotic diet led to a reduction in mood disturbance compared to the placebo group. The mean difference was -6.97, with a 95% confidence interval of -13.6 to -0.345, and a p-value of 0.039. This corresponds to a Cohen's d effect size of -0.60. However, there was little evidence to suggest that the probiotic or synbiotic treatments had a significant impact on reducing mood disturbance compared to the placebo group. The mean difference for the probiotic group was -2.17 (95% CI: -8.72, 4.38; p = 0.51) and for the synbiotic group was -0.331 (95% CI: -6.81, 6.15; p = 0.92). These effect sizes correspond to Cohen's d values of -0.19 and -0.03, respectively. At week 20, the follow-up assessment revealed no significant differences in mood disturbance between the treatment groups. Furthermore, it was observed that the intake of prebiotics in the diet groups had returned to levels similar to the baseline, indicating a lack of sustained effect on prebiotic intake.

These findings suggest that the initial improvements in mood disturbance observed during the study were not maintained in the long term and the impact of prebiotic intake on mental health may be limited. The reasons behind the differential response observed between the prebiotic diet group, which showed improved mood, and the synbiotic diet group, which did not, are puzzling. The authors suggest that one possible explanation could be the competition between native bacteria and probiotic bacteria. However, they caution against jumping to the conclusion that the prebiotic diet alone was solely responsible for the positive outcomes given that the symbiotic group did not perform any better than placebo.

## Are there studies to convince listeners that some culturally favorite foods are beneficial to mental health?

Let's talk about chocolate! In a notable cross-sectional study conducted by [Jackson et al. in 2019](#), the relationship between chocolate consumption and depressive symptoms was

# Best Diet For Mood Update 2023

*Austin Coleman, David Puder, MD*

evaluated. The study observed data from 13,626 participants participating in the National Health and Nutrition Examination Survey. Among the participants included in the study, it was found that 11.1% reported consuming chocolate based on the data obtained from two 24-hour dietary recall assessments. Within this subset of participants it was found that 12.1% reported consuming dark chocolate specifically. Fascinatingly, the study revealed that while non-dark chocolate consumption did not exhibit a significant association with clinically relevant depressive symptoms, a noteworthy discovery emerged in relation to dark chocolate consumption. Those who reported consuming dark chocolate showcased significantly lower odds (OR = 0.30, 95% CI 0.21–0.72) of experiencing clinically relevant depressive symptoms. Furthermore, when delving deeper into the analysis and stratifying the results based on the quantity of chocolate consumed, participants in the highest quartile of chocolate consumption (104–454 g/day) exhibited a 57% reduction in the odds of depressive symptoms compared to those who reported no chocolate consumption (OR = 0.43, 95% CI 0.19–0.96), with adjustments made for dark chocolate consumption. This study sheds light on the potential benefits of dark chocolate in mitigating depressive symptoms and highlights the intriguing interplay between chocolate consumption and mental well-being.

The authors of the study provide several potential explanations for the observed effects. One possibility is that the high content of anti-inflammatory flavonoids in dark chocolate may play a significant role. Additionally, the consumption of chocolate, known for its pleasurable experience, could interact with various neurotransmitter systems involved in reward pathways and mood regulation. It is worth noting that chocolate contains several psychoactive ingredients that may contribute to its effects on mental well-being.

In another intriguing study regarding chocolate conducted by [Shin et al. in 2022](#), the researchers aimed to explore the impact of dark chocolate consumption on mood with a specific focus on the gut-brain axis. They designed a randomized-controlled trial involving 48 participants between 20 and 30 years of age. To ensure the study's validity, the participants selected for the trial had specific criteria—they were individuals who did not regularly consume sweets like chocolate or candy, did not have diabetes, did not exhibit significant depression based on Beck Depression Inventory Scores, and had not undertaken any interventions that could affect their gut microbiome, such as gastrointestinal surgery, antibiotic use within the past three months, or pre/probiotic consumption within the last six months.

The participants in this study were divided into three intervention groups: 85% dark chocolate (n=18), 70% dark chocolate (n=16), and control (n=14). The individuals in the chocolate groups were instructed to consume 10g of chocolate three times per day for a duration of 3 weeks. On the other hand, the control group did not receive any chocolate and was instructed to return after the 3-week period. The primary outcome measure used to assess mood in this study was the Positive and Negative Affect Schedule (PANAS). The PANAS is a self-report scale that measures the extent to which participants experience 20 different emotions over the past week.

# Best Diet For Mood Update 2023

*Austin Coleman, David Puder, MD*

The study findings revealed there was no significant impact on positive affect with the consumption of dark chocolate; however, the group that consumed 85% dark chocolate showed a significant decrease in negative affect ( $-4.33 \pm 5.91$ ,  $P=.029$ ). The change in negative affect following the intervention was not significantly different in the group that consumed 70% dark chocolate compared to the control group. The authors point out that these results suggest that the cocoa content within chocolate may give a dose-dependent effect on mood and propose that the mood-altering effects of dark chocolate may be attributed to the presence of polyphenols in cocoa. They refer to a previous randomized-controlled trial that examined the impact of polyphenol treatment on mood. The findings of this RCT align with their own study, indicating that mood was influenced when participants consumed approximately 400 mg of polyphenols per day, which was achieved through the intake of 85% dark chocolate. This suggests that the polyphenols present in dark chocolate, including flavonoids as discussed in the previous study, play a role in the observed mood effects.

In addition to measuring mood, the authors of this study took a unique approach by investigating the impact of dark chocolate consumption on gut microbial diversity. Stool samples were collected before and after the intervention and genomic DNA sequencing was performed to assess gut microbial diversity using metrics such as Faith's Phylogenetic Diversity Index and Operational Taxonomic Units (OTU). The results showed that daily intake of 85% dark chocolate significantly increased the diversity of gut microbial communities ( $p = .017$  for Faith's PD and  $p = .003$  for OTUs).

In addition to assessing gut microbial diversity and mood separately, the authors of this study further analyzed the relationship between the two. They found a negative correlation between the negative affect score on the PANAS and the number of observed OTUs ( $r = -0.402$ ,  $P=.025$ ). This means that as the number of observed OTUs increased (which was significantly higher with the consumption of 85% dark chocolate), the negative affect score decreased. In other words, there was a connection between the diversity of gut bacteria and improved mood, specifically a reduction in negative emotional states. In relation to the previous findings, the authors emphasize that the absorption of polyphenols is dependent on the activity of gut microbiota. The bacteria within the gut microbiome play a crucial role in metabolizing polyphenols, facilitating their proper absorption. Moreover, the metabolism of polyphenols by gut bacteria can also have a direct impact on the composition and functioning of the gut microbiome, highlighting the bidirectional relationship between polyphenols and the microbiota.

Why just chocolate? How about a mocha? While there are a wealth of studies examining the association between coffee consumption and depression, many of them are observational in nature and fail to adequately control for confounding variables, particularly diet. Recognizing this limitation, [Navarro et al. in 2018](#) specifically aimed to investigate the effects of coffee consumption on depression while accounting for adherence to the Mediterranean diet. The study cohort comprised participants from the "Seguimiento Universidad de Navarra" (SUN) project, a prospective cohort designed to investigate the association between diet and chronic



# Best Diet For Mood Update 2023

Austin Coleman, David Puder, MD

diseases. The selected sample for this particular study consisted of 14,413 Spanish university graduates who were free of depression diagnosis or antidepressant use at the beginning of the study and within the initial two years of follow-up. These participants were followed for an average of 10 years. When comparing the highest and lowest categories of coffee consumption, it was observed that individuals who consumed at least 4 cups of coffee per day had a 63% lower risk of depression (HR = 0.37, 95% CI 0.15–0.95) compared to those who consumed less than 1 cup of coffee per day. However, it is important to note that this difference did not reach statistical significance, as indicated by a p-value of 0.22. While the coffee may not have had much of an impact, the cohort of 14,413 individuals in this study exhibited a remarkably low incidence of depression, with only 199 new cases observed over the 10-year follow-up period. When examining the baseline characteristics of the cohort, it was found that their average adherence to the Mediterranean diet, measured on a scale of 0-9, was around 4. While the exact factors contributing to the low incidence of depression in this cohort are not fully understood, it is noteworthy that the majority of participants exhibited at least partial adherence to the Mediterranean diet.

## References:

Bayes, J., Schloss, J., & Sibbritt, D. (2022). The effect of a Mediterranean diet on the symptoms of depression in young males (the “AMMEND: A Mediterranean diet in men with depression” study): A randomized controlled trial. *The American Journal of Clinical Nutrition*, *116*(2), 572–580. <https://doi.org/10.1093/ajcn/nqac106>

Francis, H. M., Stevenson, R. J., Chambers, J. R., Gupta, D., Newey, B., & Lim, C. K. (2019). A brief diet intervention can reduce symptoms of depression in young adults – a randomised controlled trial. *PLOS ONE*, *14*(10). <https://doi.org/10.1371/journal.pone.0222768>

Freijy, T. M., Cribb, L., Oliver, G., Metri, N.-J., Opie, R. S., Jacka, F. N., Hawrelak, J. A., Rucklidge, J. J., Ng, C. H., & Sarris, J. (2023). Effects of a high-prebiotic diet versus probiotic supplements versus synbiotics on adult mental health: The “Gut Feelings” randomised controlled trial. *Frontiers in Neuroscience*, *16*. <https://doi.org/10.3389/fnins.2022.1097278>

Jacka, F. N., O’Neil, A., Opie, R., Itsiopoulos, C., Cotton, S., Mohebbi, M., Castle, D., Dash, S., Mihalopoulos, C., Chatterton, M. L., Brazionis, L., Dean, O. M., Hodge, A. M., & Berk, M. (2017). A randomised controlled trial of dietary improvement for adults with major depression (the ‘smiles’ trial). *BMC Medicine*, *15*(1). <https://doi.org/10.1186/s12916-017-0791-y>

Jackson, S. E., Smith, L., Firth, J., Grabovac, I., Soysal, P., Koyanagi, A., Hu, L., Stubbs, B., Demurtas, J., Veronese, N., Zhu, X., & Yang, L. (2019). Is there a relationship between chocolate consumption and symptoms of depression? A cross-sectional survey of 13,626 US adults. *Depression and Anxiety*, *36*(10), 987–995. <https://doi.org/10.1002/da.22950>

# Best Diet For Mood Update 2023

Austin Coleman, David Puder, MD

Lane, M. M., Gamage, E., Travica, N., Dissanayaka, T., Ashtree, D. N., Gauci, S., Lottfaliany, M., O'Neil, A., Jacka, F. N., & Marx, W. (2022). Ultra-processed food consumption and mental health: A systematic review and meta-analysis of observational studies. *Nutrients*, *14*(13), 2568. <https://doi.org/10.3390/nu14132568>

Navarro, A., Abasheva, D., Martínez-González, M., Ruiz-Estigarribia, L., Martín-Calvo, N., Sánchez-Villegas, A., & Toledo, E. (2018). Coffee consumption and the risk of depression in a middle-aged cohort: The sun project. *Nutrients*, *10*(9), 1333. <https://doi.org/10.3390/nu10091333>

Parletta, N., Zarnowiecki, D., Cho, J., Wilson, A., Bogomolova, S., Villani, A., Itsiopoulos, C., Niyonsenga, T., Blunden, S., Meyer, B., Segal, L., Baune, B. T., & O'Dea, K. (2017). A Mediterranean-style dietary intervention supplemented with fish oil improves diet quality and mental health in people with depression: A randomized controlled trial (HELFIMED). *Nutritional Neuroscience*, *22*(7), 474–487. <https://doi.org/10.1080/1028415x.2017.1411320>

Shin, J.-H., Kim, C.-S., Cha, L., Kim, S., Lee, S., Chae, S., Chun, W. Y., & Shin, D.-M. (2022). Consumption of 85% cocoa dark chocolate improves mood in association with gut microbial changes in healthy adults: A randomized controlled trial. *The Journal of Nutritional Biochemistry*, *99*, 108854. <https://doi.org/10.1016/j.jnutbio.2021.108854>

Vermeulen, E., Stronks, K., Snijder, M. B., Schene, A. H., Lok, A., de Vries, J. H., Visser, M., Brouwer, I. A., & Nicolaou, M. (2017). A combined high-sugar and high-saturated-fat dietary pattern is associated with more depressive symptoms in a multi-ethnic population: The helius (healthy life in an urban setting) study. *Public Health Nutrition*, *20*(13), 2374–2382. <https://doi.org/10.1017/s1368980017001550>