

Literature Review of Felice N. Jacka Fall, 2015

1. Jacka FN, Pasco JA, Mykletun A, et al. Association of Western and traditional diets with depression and anxiety in women. Am J Psychiatry. 2010;167(3):305-11. doi: 10.1176/appi.ajp.2009.09060881.

Intention: To discuss a 2010 Australian study suggesting a direct relationship between poor diet quality and poor mental health in women

Notes: To explore the relationship between diet quality and psychological well-being, investigators randomly selected for analysis the dietary and mental health data from a sample of 1,046 women aged 20-93 years.

Investigators determined that adhering to a so-called traditional diet largely consisting of vegetables, fruit, meat, fish and whole grains was associated with reduced odds for experiencing major and mild depression and with lower probability for experiencing anxiety disorders.

A so-called western diet emphasizing processed and/or fried foods, refined grains, heavily sweetened products and beer was associated with more symptoms of psychological disorder.

In short, poor habitual diet quality is associated with increased presence of the high-prevalence mental disorders depression and anxiety.

2. Jacka FN, Kremer PJ, Leslie ER, et al. Associations between diet quality and depressed mood in adolescents: results from the Australian Healthy Neighbourhoods Study. Aust N Z J Psychiatry. 2010;44(5):435-442. doi: 10.3109/00048670903571598.

Intention: To discuss a 2010 Australian study suggesting an inverse relationship between diet quality and depression in adolescents

Notes: Investigators assessed 7,114 adolescents, aged 10–14 years, who participated in the Australian Healthy Neighbourhoods Study. Diet quality scores were calculated from participants' responses to a dietary questionnaire. Depression was determined utilizing participants' responses to the Short Mood and Feelings Questionnaire (SMFQ) for adolescents.

Participants who scored highest (5/5) on the healthy diet scale almost halved their likelihood for experiencing symptomatic depression as compared with participants whose diet scores were lowest, suggesting an inverse relationship between diet and depression.

However, investigators explained, because the study was cross-sectional and not longitudinal, the direction of the relationship between diet and depression could not be concluded. That said, outcomes demonstrated an inverse relationship between diet quality and adolescent depression regardless of age, gender, physical activity, father's work status, socioeconomic status, adolescent diet scale, and family conflict. Furthermore, that indirect relationship largely followed a dose-response curve between unhealthy diet and odds of experiencing depressive symptoms.

Finally, these findings reinforced previous cross-sectional and longitudinal study results indicating relationships between **1.** adolescents' diet quality and subsequent mental health and between **2.** adults' diet quality and depression. In short, adolescent and adult studies indicate that poor diet quality contributes to the risk for developing symptomatic depression.



3. Jacka FN, Maes M, Pasco JA, Williams LJ, Berk M. Nutrient intakes and the common mental disorders in women. J Affect Disord. 2012;141(1):79-85. doi: 10.1016/j.jad.2012.02.018.

Intention: To discuss a 2012 Australian study suggesting that dietary intakes of magnesium, folate and zinc are implicated in the development of depressive illness in women

Notes: Among a large, randomly-selected and population-based sample of women, investigators examined the relationship between the dietary intake of magnesium, folate and zinc and clinically determined disorders and symptoms of depression and anxiety.

Nutrient intakes were determined by participants' responses to a validated food frequency questionnaire. Additionally, participants' responses to the General Health Questionnaire-12 (GHQ-12) determined their psychological symptoms and their responses during a clinical interview (conducted according to the Structured Clinical Interview for DSM-IV-TR, non-patient edition) determined the presence, absence and extent of their depressive and anxiety disorders.

Results did not indicate a relationship between any of the three investigated nutrients and anxiety disorders. However, the nutrient triad was associated with depression. More specifically, after adjustments for calorie/energy intake, results demonstrated that increased intakes of zinc, magnesium and folate were associated with reduced risk for development of major depression/dysthymia. Findings also indicated an inverse relationship between **1.** the intake of both magnesium and zinc and **2.** GHQ-12 scores. Furthermore, these relationships were demonstrable regardless of age, socioeconomic status, education or other health-related behaviors.

4. O'Neil A, Berk M, Itsiopoulos C, et al. A randomised, controlled trial of a dietary intervention for adults with major depression (the "SMILES" trial): study protocol. BMC Psychiatry. 2013;13:114. doi: 10.1186/1471-244X-13-114.

Intention: To discuss the study protocol of an Australian randomized controlled trial (RCT) that commenced in 2013 to investigate the efficacy and cost-efficacy of a dietary program to treat Major Depressive Episodes (MDE)

Notes: Investigators randomized 176 participants suffering from MDE into either **1.** a dietary intervention group or a **2.** a control condition comprised by a social support group. Participants' depression statuses were evaluated utilizing the Montgomery-Åsberg Depression Rating Scale (MADRS) and Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders (Non-Patient Edition) (SCID-I/NP).

The intervention and control conditions began within one week of participants' baseline assessments. The intervention was comprised by seven individual nutrition consulting sessions (each about one hour long) delivered by Accredited Practicing Dietitians (APD). The intervention emphasized adhering to healthy diets derived from the Australian Dietary Guidelines and the Dietary Guidelines for Adults in Greece. The control condition consisted of a befriending protocol (comprised by trained personnel conversing about neutral topics of interest with participants to maintain their positive engagement) following the same visit schedule and duration as the dietary intervention.

The study was being conducted at two sites in Victoria, Australia: **1.** a metropolitan center and **2.** a regional center. Data collection occurred at three time points: **1.** baseline (pre-intervention), **2.** three months (post-intervention) and **3.** six months (post-intervention). The primary outcome measure was participants' MADRS score at three months. A cost-consequences analysis (CCA) was conducted to determine the intervention's economic merit.



Investigators stated that if the program proved efficacious, it could be enlisted as an alternative or complementary treatment technique for managing major depression as well as for directly and indirectly managing typical comorbidities including cardiovascular disease (CVD), obesity and type 2 diabetes.

Published results are forthcoming.

5. Jacka FN, Ystrom E, Brantsaeter AL, et al. Maternal and early postnatal nutrition and mental health of offspring by age 5 years: a prospective cohort study. J Am Acad Child Adolesc Psychiatry. 2013;52(10):1038-1047. doi: 10.1016/j.jaac.2013.07.002.

Intention: To discuss a 2013 Australian study indicating that early nutritional exposures were independently related to children's risk for developing behavioral and emotional dysfunction.

Notes: Between 1999 and 2008, the large prospective Norwegian Mother and Child Cohort Study (MoBa) recruited pregnant women. Data were collected during pregnancy and postnatally when children were six months and 1.5, 3 and 5 years old. The sample for this study was gleaned from MoBa and comprised by 23,020 women and their children.

From ages 1.5 to 5 years, children's internalizing behaviors (anxiety and depression) and externalizing behaviors (oppositional defiant disorder, conduct disorder and attention-deficit/hyperactivity disorder (ADHD)) were recorded as a function of their mothers' perinatal diet quality and their diet quality at 1.5 and 3 years of age. Diet quality was assessed through evaluation of self-reported dietary patterns and characterized as "healthy" or "unhealthy."

Statistical adjustments were made for sex of the child, maternal depression, maternal and paternal age, maternal education level, household income, maternal smoking before and during pregnancy, mothers' parental locus of control and marital status.

Ultimately, higher intakes of unhealthy foods during pregnancy predicted children's externalizing behaviors (oppositional defiant disorder, conduct disorder and attention-deficit/hyperactivity disorder (ADHD)). Additionally, children with high levels of postnatal unhealthy diet exhibited elevated levels of both internalizing (anxiety and depression) and externalizing behaviors. Furthermore, children with low levels of postnatal healthy diet also exhibited high levels of both internalizing and externalizing problems.

Within the large sample of mothers and children participating in this study, perinatal and early postnatal nutrition was independently related to the risk for experiencing dysregulated childhood behaviors and emotions.

6. Hoare E, Millar L, Fuller-Tyszkiewicz M, et al. Associations between obesogenic risk and depressive symptomatology in Australian adolescents: a cross-sectional study. J Epidemiol Community Health. 2014;68(8):767-72. doi: 10.1136/jech-2013-203562.

Intention: To discuss a 2014 Australian study indicating a relationship between obesity and related risk behaviors and depressive symptomatology in an Australian adolescent population

Notes: Baseline data were collected from the Australian Capital Territory *It's Your Move* (ACT-IYM) project, an Australian community-based intervention, in 2012. Ultimately, 800 students (440 females, 360 males) aged 11-14 years were weighed and measured and asked to complete a questionnaire including inquiries about physical activity/inactivity and dietary intake. World Health Organization (WHO) criteria defined weight status. Symptomatic depression was indicated by a cut-off score ≥ 10 on the Short Mood and Feelings Questionnaire (SMFQ).



After controlling for potential confounders, results indicated significantly higher risk for depressive symptomatology in males and females who surpassed recommendations for daily screen-time during sedentary leisure activity. Additionally, females who drank larger quantities of sweetened beverages exhibited higher risk for depressive symptoms than did those who drank less. Furthermore, overweight/obese males demonstrated higher risk for depressive symptoms than did adolescent males of WHO-determined normal weight.

This study indicated relationships between obesogenic risks and depression in Australian adolescents, suggesting that mental health outcomes should be included in the premises and assessments of diet and activity interventions.

7. Nanri A, Eguchi M, Kuwahara K, et al. Macronutrient intake and depressive symptoms among Japanese male workers: the Furukawa Nutrition and Health Study. *Psychiatry Res.* 2014;220(1-2):263-268. doi: 10.1016/j.psychres.2014.08.026.

Intention: This 2014 Japanese study suggested an inverse relationship between protein consumption and depressive symptoms among 1,794 male workers, aged 18-69 years, who participated in a survey about health status

Notes: Dietary intake was determined by participants' responses to a validated, self-administered diet history questionnaire. Participants' depressive symptoms were assessed according to the Center for Epidemiologic Studies Depression (CES-D) scale.

Statistical adjustments were made for the intake of folate, vitamins B6 and B12, polyunsaturated fatty acid (PUFA), magnesium and iron. Ultimately, neither carbohydrate nor fat intake was associated with depressive symptoms - but protein was.

More specifically, among those participants who consumed the most protein, the risk for developing depression was 26% less than the risk among those participants who consumed the least protein. The inverse relationship between protein consumption and depressive symptoms was more pronounced when a cut-off value of CES-D score ≥ 19 - vs ≥ 16 - was deemed indicative of symptomatic depression. Additionally, this study found that the prevalence of depressive symptoms tended to decrease as the intake of plant-based protein increased.

Overall, findings suggest that low protein intake may be related to higher prevalence of depressive symptoms in Japanese male workers.

8. Opie RS, O'Neil A, Itsiopoulos C, Jacka FN. The impact of whole-of-diet interventions on depression and anxiety: a systematic review of randomised controlled trials. *Public Health Nutr.* 2015;18(11):2074-2093. doi: 10.1017/S1368980014002614.

Intention: In 2015, Australian investigators conducted a systematic review of randomized controlled trials (RCTs) of dietary interventions for treatment of depression and/or anxiety to identify effective strategies

Notes: Investigators conducted a systematic search of the Cochrane, MEDLINE, EMBASE, CINAHL, PubMed and PsycInfo databases for articles published between April 1971 and May 2014.

Of the 1,274 articles identified, 17 were eligible for inclusion. All articles reported depression outcomes and 10 reported outcomes of anxiety or total mood disturbance. Almost half (47%) of the analyzed studies demonstrated significant effects on depression scores in participants dietarily treated for depression. The remaining studies exhibited a null effect which is to say that participants dietarily treated for depression did not score significantly lower on depression



scales. Effective dietary interventions employed dietitians and were less likely to include recommendations to **1.** decrease red meat intake, to **2.** select leaner meats or to **3.** adhere to a low-cholesterol diet.

Ultimately, reviewers found some evidence that dietary interventions improve depression outcomes. However, because only one investigation specifically studied the effect of a dietary intervention in participants with clinical depression, reviewers cite that more research is needed to examine and determine the efficacy of dietary improvement on mental health outcomes.

9. Dipnall JF, Pasco JA, Meyer D, et al. The association between dietary patterns, diabetes and depression. J Affect Disord. 2015;174:215-224. doi: 10.1016/j.jad.2014.11.030.

Intention: This 2015 Australian study indicated an interrelationship among dietary patterns, diabetes and depression

Data for 4,588 adults aged 18+ years were collected from the National Health and Nutrition Examination Study (2009-2010). Depressive symptoms were measured per the Patient Health Questionnaire-9 (PHQ-9) and diabetes status was determined via **1.** self-report, **2.** usage of diabetic medication and/or **3.** fasting glucose levels ≥ 126 mg/dL and a glycated hemoglobin level $\geq 6.5\%$ (48 mmol/mol). Additionally, a 24-hour dietary recall interview was conducted to determine food intake.

Upon analysis, dietary patterns and diabetes were deemed the predictors (independent variables) and depression was considered the outcome (dependent variable). Covariates included gender, age, marital status, education, race, adult food insecurity level, ratio of family income to poverty and serum C-reactive protein (CRP) levels.

Analyses revealed five dietary patterns accounting for 39.8% of the total variance in likelihood for depressive symptoms: **1.** healthy; **2.** unhealthy; **3.** sweets; **4.** so-called "Mexican" style; and **5.** breakfast. The sweets diet was associated with a higher probability of depression for participants with - vs. without - diabetes. In fact, results indicated that the seemingly positive relationship between the sweets diet and depression diminished when diabetes was introduced as a covariate. Investigators surmise that the diminishment is explained by diabetes development itself - vs. the high-sugar diet predisposing diabetes development - evoking depression. .

The healthy dietary pattern was associated with decreased probability of depression for participants with and without diabetes, though the healthy pattern was associated with lower probability in participants with diabetes.

Overall, findings demonstrated a relationship between healthy dietary pattern and decreased likelihood of depressive symptoms, especially in those with type 2 diabetes.

10. Jacka FN, Cherbuin N, Anstey KJ, Sachdev P, Butterworth P. Western diet is associated with a smaller hippocampus: a longitudinal investigation. BMC Med. 2015;13:215. doi: 10.1186/s12916-015-0461-x.

Intention: This novel study aimed to **1.** evaluate the relationship between dietary patterns and human hippocampal volume and to **2.** assess whether diet was associated with variable rates of human hippocampal atrophy over time

Notes: Data were gathered from a cohort subsample (n = 255) of the Personality and Total Health (PATH) Through Life Study. The subsample was comprised by older adult participants



who **1.** were aged 60–64 years at baseline in 2001, **2.** completed a food frequency questionnaire and **3.** underwent two magnetic resonance imaging (MRI) scans approximately four years apart. Analyses were performed to assess the association between dietary factors and left and right hippocampal volumes over time.

Results did not indicate any relationship between dietary patterns and right hippocampal volume. On the other hand, each one-point standard deviation increase in the so-called “prudent” (healthy) dietary pattern was associated with a 45.7 mm³ larger volume in the left hippocampus. Additionally, greater consumption of a so-called “Western” (unhealthy) dietary pattern was (independently) associated with a 52.6 mm³ smaller volume in the left hippocampus. These relationships existed independently of covariates including age, gender, education, labor-force status, depressive symptoms and medication, physical activity, smoking, hypertension and diabetes.

Overall, consuming fewer nutrient-dense foods and more unhealthy foods were each independently associated with smaller left hippocampal volume. Multiple investigations demonstrate that the left hemisphere - and particularly the left hippocampus- is more prone to neurodegeneration thus would be more sensitive to the impact of consuming a poor-quality diet. More specifically, recent meta-analyses indicated that in Alzheimer’s disease and mild cognitive impairment - but **not** in normal aging - the left hippocampus is smaller than the right. Therefore, results suggest that adhering to a healthy diet could beneficially impact the volume of the left hippocampus and consequent cognitive function over time.

