THE CARB-APPROPRIATE REVIEW

THE STRESS ISSUE

A MONTHLY RESEARCH REVIEW BY

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In association with The Holistic Performance Institute

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ABOUT CLIFF

Dr Cliff Harvey is an author, clinician, and researcher. He was one of the first clinical nutritionists to begin working with ketogenic and low-carb diets, way back in the 1990s and is also considered a pioneer in the area of mind-body integrative healthcare.

Cliff's early post-graduate work was in mind-body healthcare, while his master's research focussed on the use of medium-chain triglycerides to mitigate 'keto-flu' and encourage faster induction of nutritional ketosis.

His doctoral thesis continued to investigate keto-flu and ketogenesis, and the effects of different types of low-carbohydrate diets along with the individualisation of dietary prescription and how 'carbohydrate tolerance' varies from person-to-person.

He is a former world champion strength athlete, submission grappler, and author of several best-selling books, including *The Carbohydrate Appropriate Diet*, *Carb-Appropriate 101*, *Time Rich Cash Optional* and *The Credo.*

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THIS MONTH

THE EFFECTS OF STRESS ON HEALTH

Key points

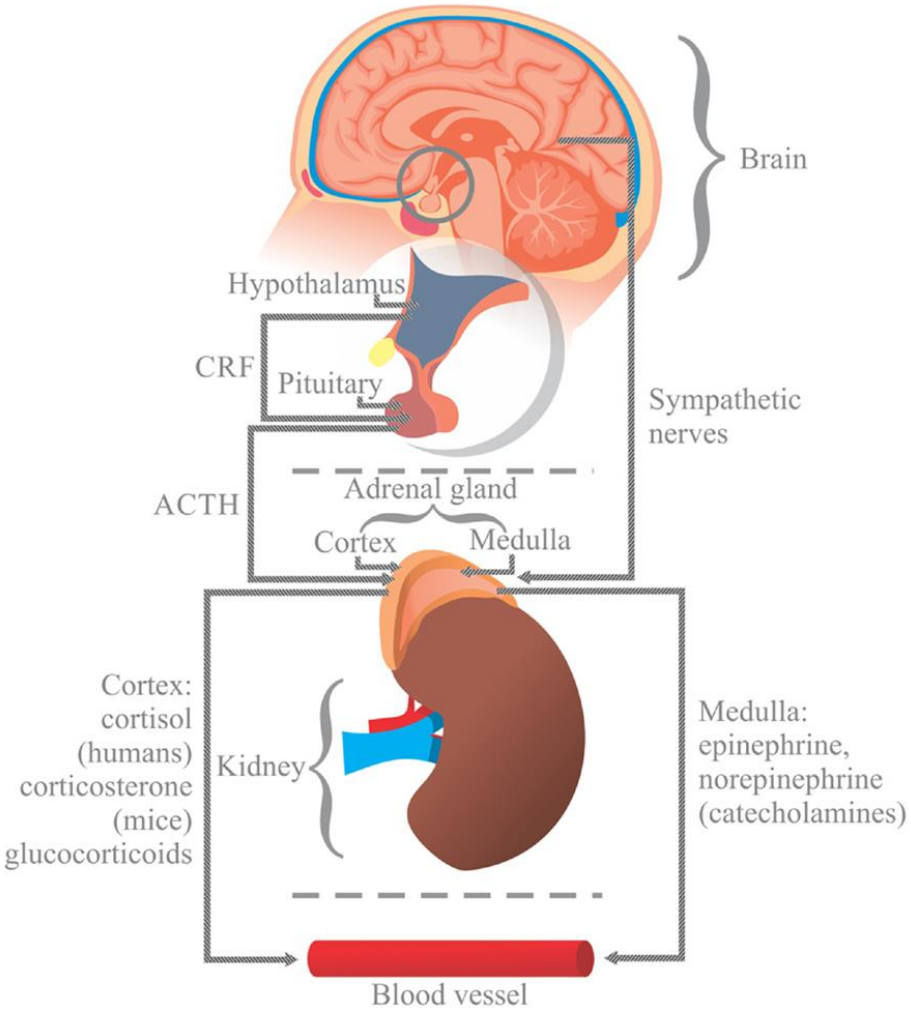
- Stress and its responses are a natural part of our ability to survive and thrive
- However, both acute and chronic stress that cannot be reconciled and recovered from, results in lasting health implications
- Excessive stress is related to poor health, pain, loss of quality of life, increased risk of cancer and cardiovascular disease and worsened all-cause mortality
- Work-related stress is heightened by a reward-to-effort imbalance
- At-risk people including first-responders, active military, healthcare workers, lower-socioeconomic groups and discriminated minorities are at greater risk of unhealthy stress burdens

Thousands of papers have been written on the effects of stress on health. That there is an effect of stress on many health outcomes is undeniable, but it still is often given only token appreciation in many areas of clinical practice.

In this context, we mean stress in the *psychoneurophysiological* (mind-body) context. So, in other words, the stressors that are usually psychological, but that exert an effect on the mind and body. Stress is the body's response to any stressor. The stressor is typically a threat, and so, the body responds to the presence of a threat (or challenge) with chemical and structural changes to allow us to respond to appropriately. The two major systems that respond to stress are the autonomic nervous system and the hypothalamic-pituitary-adrenal (HPA) axis.

The sympathoadrenal medullary (SAM) axis activates the fight-or-flight response through the sympathetic nervous system, which dedicates energy to relevant body systems (such as the working muscles to enable you to run away from a tiger) and once the threat is effectively dealt with, the parasympathetic nervous system ('rest and digest') returns the body to homeostasis. Secondarily, the HPA axis regulates the release of cortisol, which exerts influence on metabolic, psychological and immune functions.

These various mechanisms combined allow the actions to resolve the threat but also interplay with our innate reward system, memory and cognition, immune function, and metabolic state.



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doi: 10.3389/fnint.2013.00086 http://journal.frontiersin.org/article/10.3389/fnint.2013.00086/full CC BY 3.0

Nowadays, most of the stressors we encounter are not life-threatening (although they may be socially threatening) but our responses are still the same.

> Most of the stressors we encounter are not life-threatening, but our responses are still the same

Life-Stress

Life stress has a range of physical effects and similarly to any other stressor, influences the HPA axis, hypothalamic-pituitary-gonadal axis, SAM axis, and the immune system.[1] Severe or repeated life-stressors that cannot be adequately reconciled mentally and recovered from physically can result in severe stress-related effects including 'burnout' and chronic fatigue,[2] and even worrying *about* stressful events increases the amount of 'wear and tear' on the mind and body.[3]

> Worrying *about* stressful events increases the amount of 'wear and tear' on the mind and body

Chronic stress is involved in the development or exacerbation of many mental and physical conditions, including asthma, rheumatoid arthritis, anxiety disorders, depression, cardiovascular disease, chronic pain, human immunodeficiency virus/AIDS, stroke, and cancer.[4]

Acute stressors (like work-related incidents in hospitals) can induce long-term post-traumatic stress disorder (PTSD), depression, and anxiety.[5] Severe traumas (such as abuse when young) can also result in an increase in health problems overall and an increase in pain associated with health conditions.[6]

Acute stressors and trauma can result in[7]:

- poor general physical health
- increased pain and disability
- lower quality of life
- higher risk of all-cause mortality
- increased rates of depression, and anxiety
- psychosocial outcomes (e.g. increased family conflict)

Stress responses that are not properly modulated (resulting in either excessive or insufficient stress responses to stimuli) adversely affect later health outcomes. In a review of 47 studies[i] both high and low-stress reactivity of both the SAM system and the HPA axis were related to health and disease outcomes at follow-up. Exaggerated stress reactivity predicted an increase in risk

[i] *n* = 32,866

for cardiovascular disease and decreased telomere length (a sign of cellular ageing). In contrast, blunted stress reactivity predicted future obesity, depression, anxiety and PTSD symptoms, greater illness frequency, musculoskeletal pain, immune dysfunction, poorer cognitive ability, poorer self-reported health, physical disability and lower bone mass.[8]

The role of work-related stress in health

Work stress is associated with a 50% increase in the risk of cardiovascular disease.[9] Stress alone is not the biggest factor in poor outcomes though, it mostly relates to 'effort-to-reward imbalance. In other words, if the perceived reward from work is not proportionate to the effort of work, the stress effect is amplified. Similarly, overcommitment to tasks is also related to increased stress and poorer cardiovascular health outcomes. Poorer reward-to-effort ratios are associated with increased hypertension and arterial thickening.[9]

> Work stress is associated with a 50% increase in the risk of cardiovascular disease

The effects of stress on health in adolescents

Adolescence is considered a 'stressful' time due to rapidly changing societal and familial status, along with physiological changes and peer-group pressures. Failure to be able to effectively cope with psychosocial stressors can result in increased rates of depression, anxiety, and abuse and bullying.[10]

> Failure to be able to effectively cope with psychosocial stressors can result in increased rates of depression, anxiety, and abuse and bullying

Stress and cancer

In a review on the effects of stress on biological pathways in women with breast cancer, it was concluded that psychological interventions to reduce stress can influence stress-hormone pathways and the immune system,[11] the implication being that stress might worsen outcomes and conversely, that 'stress-protection' might improve them.

The effects of stress on mental health in at-risk groups

The effects of stress on mental health have been extensively studied in high-risk populations.

In refugees and asylum-seekers, it has been found that resettlement and other traumas are independent risk factors for post-traumatic stress disorder (PTSD). Trauma and resultant PTSD are also risk factors for major depression. Additional predictors of mental health disorders are financial insecurity, unemployment, and residence insecurity (lack of 'status' in a country and housing insecurity).[12] PTSD is now considered an 'expected outcome' for refugees and asylum seekers.[13] The effects of stress related to the refugee experience are mitigated by faith, coping skills, and social support.[13]

> PTSD is now considered an 'expected outcome' for refugees and asylum seekers

Minority groups such as the LGBTQ+ community also have higher rates of mental illness related to 'minority stress' due to discrimination, persecution, and lessened opportunity.[14, 15] Social support, community, connectedness, and effective coping strategies are beneficial.[16]

In the wake of the Haiti earthquake of 2010 which left that countries economy and infrastructure ravaged, it was found that the quake resulted in high rates of PTSD, depression, anxiety, and other mental health problems in survivors. Socioeconomic status, the exposure level to the earthquake itself, low social support and personal or family history of a mental health disorder or other forms of trauma were the major risk factors for developing mental health disorders after the earthquake.[17]

Additionally:

- People with pre-existing mental health conditions such as bipolar disorder are more likely to suffer PTSD as a result of experiencing trauma.[18]
- Studies on military veterans have suggested that PTSD and comorbid depressive disorders are related to an increased risk of dementia.[19]
- The stress-sleep relationship is also considered to be important in the interplay between domestic violence and children's health and development.[20]

Stress and socioeconomic status

Poorer people are exposed to more life stress due to financial insecurity. It has been demonstrated that in the wake of natural disasters like earthquakes, this plays a major role in the development of subsequent stress and other mental health disorders.[17] A neuroimmunological link has also been found between stress,

inflammation, and air pollution.[21] This and other research suggests that the stress effects of social disadvantage could be cumulative.

Stress effects of social disadvantage could be cumulative

SOCIAL MEDIA & STRESS

Key points

- Social media use is beneficial for providing connection, support, and information
- Excessive social media use can increase stress, depression, and anxiety
- Total abstinence from social media might worsen stress and feelings of loneliness
- Limiting social media exposure improves stress, depression, and anxiety
- Mindfulness activities can help to mitigate both social media use and social media-driven stress

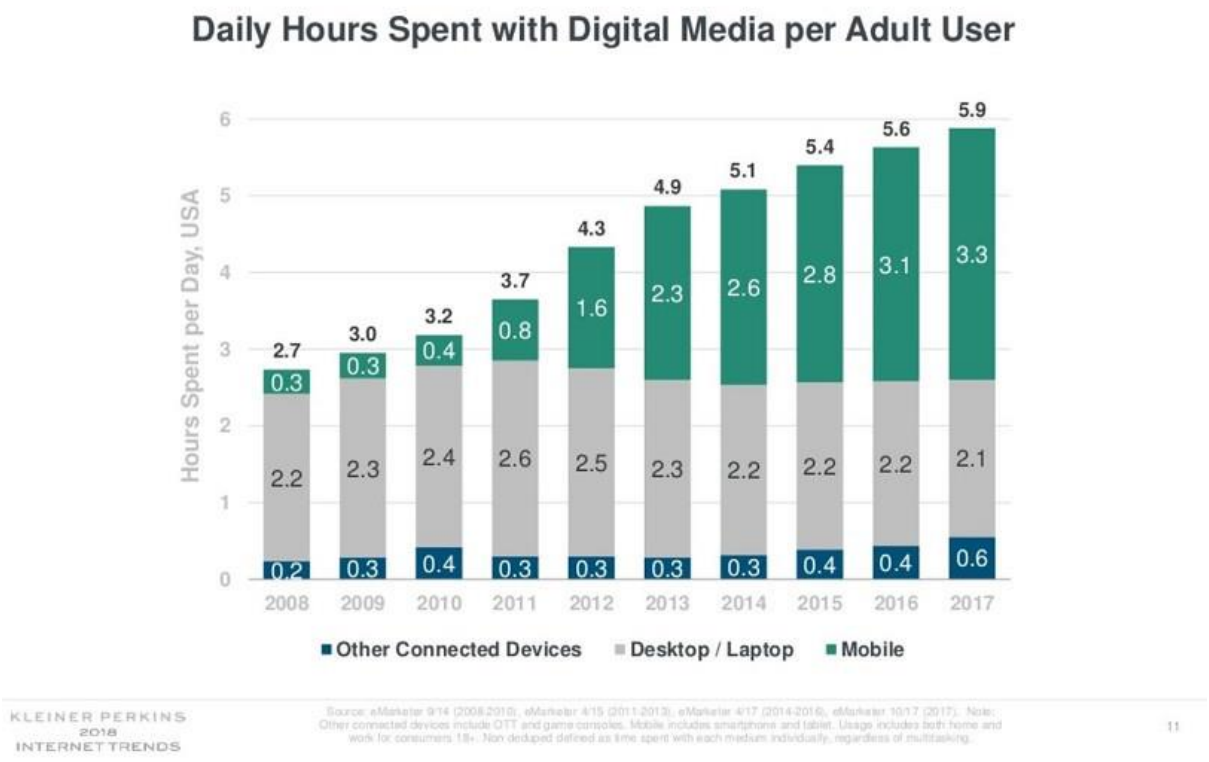
Social media use is ubiquitous in society and offers a host of benefits ranging from greater connection, targeted news, support, and a platform for businesses to engage more directly with a larger audience. However, overuse of social media is also associated with a host of health problems [see the previous article here] and problematic behaviours.

The average person now spends around 6 hours per day accessing digital media (according to a Kleiner Perkins report of 2018), with over 3 hours of that spent accessing digital media by phone. According to a 2017 survey by Deloitte, the average person also checks their phone more than 40 times per day, with younger people (under 24 years of age) checking their phones around double that.[ii]

Our obsessive drive to access information, entertainment, and distraction via social and streaming media, has a host of unwanted consequences ranging from increased rates of depression and anxiety,

[ii] https://www2.deloitte.com/us/en/pages/technology-media-and-telecommunications/articles/global-mobile-consumer-survey-us-edition.html

through to reduced sleep quality and duration with resultant effects on overall health and performance.



Of particular interest are the effects of social media on stress. Stress has a bidirectional relationship with sleep, the gut, nutrition, and in fact, all other lifestyle areas.

The average person now spends around 6 hours per day accessing digital media

Social media and stress

The use of social media springs from a desire for connection, information, support, and as a means of distraction. The evidence suggests that moderate use results in positive outcomes due to the importance of these (but social media overload to alleviate boredom might increase the propensity to become bored![22]). Social media can also be a useful conduit for information and demonstrations of exercises and activities (like yoga) that can help to combat stress (and depression).[23] However, excessive usage results in problematic behaviours

that lead to longer-term effects on health. It can lead to psychological effects due to the 'fear of missing out' and through bullying, trolling, and distorted views of others and self and social competition. Increasing levels of 'technostress' can reduce cognitive ability, affect multitasking abilities, and produce cognitive overload and addictive social media behaviours impact on efficiency, productivity, and task performance.[24]

Increasing levels of 'technostress' can reduce cognitive ability

Addictive and compulsive tendencies towards social media have the strongest effect on stress[25] and excessive social media use can result in increased perceived stress (and depression and anxiety[26, 27]) and this effect is stronger in women,[25] and is increased by time spent on social media and the number of platforms engaged with.[28] These effects might even be strongest in those who initially benefit from (moderate) social media use, especially those seeking support, as this need and benefit evokes habitual social media use.[29]

Stress correlates with time spent on social media and the number of platforms engaged with

However, in a recent trial, abstinence from social media resulted in a decline in life satisfaction, and an increase in loneliness.[30] This confirms that there is likely to be an amount of social media use that is beneficial and healthy and that excessive use is unhealthy.

Abstinence from social media resulted in a decline in life satisfaction

Social media use and acute stress

In an interesting study, 92 Facebook users were randomised to either quiet reading or using Facebook immediately after an acute stressor (Trier social stress test). While Facebook users in this study reported that they thought Facebook helped them to feel less stressed, cortisol levels were sustained at greater levels in the Facebook group compared to the readers.[31] Conversely, using Facebook *before* an acute stressor may buffer the effects of stress.[31] However, in a study on club sport athletes at university, salivary cortisol levels were increased in anticipation of an event but in females but there was a significant *decrease* in cortisol concentration in the female athletes who engaged in a normal pre-game routine compared to those who used Facebook before the game.[32]

Social media and work-related stress

Results from studies on social media use and stress are mixed. There appears to be little absolute association between social media use overall and work-related stress. Social media use might slightly reduce work-related stress.[33] However, increasing social media exposure is associated with increased work-stress.[34]

Social media and social responses

Political activism on social media is significantly associated with perceived stress.[35]

> Political activism on social media is significantly associated with perceived stress

The effect of social media on sleep and stress

Sleep quality and duration is critical to overall health [see articles here]. In particular, stress and sleep go hand-in-hand. If you are overly stressed, your sleep will suffer, conversely, if you are sleeping poorly, your stress responses and modulation will be worsened, and you are likely to over-express stress hormones.

Social media use is linked to poorer sleep (and to depression and anxiety) in young adults,[36] and adolescents, and this is strongest in those who used social media more and those more emotionally invested in the social media platform. Even after controlling for depression, anxiety, and self-esteem, night-time social media use predicted poorer sleep quality.[37] Night-time social media use is associated with later bedtimes, increased pre-sleep arousal and alertness, and difficulty getting to sleep. This results in behavioural changes, delaying the habituated sleep-time and also arousal which reduces sleep length and quality, caused at least in part by the 'fear of missing out'.[38]

How to limit the effects of social media on stress

While abstinence from social media has not been demonstrated to reduce stress and is more likely to increase it, moderation techniques can help to reduce social media-induced stress.

> Moderation techniques can help to reduce social media-induced stress

In research conducted at the University of Pennsylvania, undergraduate students were limited to using three social media platforms (Facebook, Instagram, and Snapchat) for a maximum of 10 minutes,

per platform, per day. This 'limited use' group experienced significant reductions in loneliness and depression over three weeks compared to an unlimited use group. Interestingly both groups also exhibited significant reductions in anxiety and 'fear of missing out', which suggests a benefit from awareness and self-monitoring of social media use.[39]

Self-esteem affects both social anxiety and stress, and this is purported to influence smartphone and social media use. In a study of the effect of mindfulness on these variables, it was found that mindfulness reduced smartphone use through a sequence of improved self-esteem resulting in reduced social anxiety and lessened phone use. This relationship is theorised to be cyclical with reductions in phone use being associated with improved self-esteem.[40]

Tactics to reduce social media-induced stress

- Limit the social media platforms you regularly engage in, to 3 or fewer
- Limit total time on your phone to less than 3 hours per day
- Consider blocking apps on your phone and instead access social media platforms in particular 'blocks' of time, on your computer, one or two times per day
- Limit total social media use per day to less than one hour (or even less than 30 min)
- Consider using a newsfeed blocker for Facebook and only check notifications
- Practice mindfulness every day [check out The Credo for more info on life-efficiency and mindfulness]

STRESS & WEIGHT-GAIN

Key points

- Stress reduces sleep duration and quality
- Stress-driven sleep impairment worsens diet quality and encourages fat gain
- Stress also increases inflammation and fat storage independently
- Stress-eating results in greater food intake and reduced food quality

Reviews of the evidence show a strong bi-direction relationship between stress and sleep, food intake. In other words, factors like stress worsen sleep and increase food intake, resulting in weight gain, and conversely, worsened sleep drives poorer food choices, and poor food choices worsen sleep, and obesity is a known risk for sleep disorders.[41]

Chronic stress promotes a shift to over-eating. This is in contrast to acute stress which typically reduces food intake due to the effect of the catecholamine stress hormones that act as both stimulants and appetite-suppressants.

Hyperactivation of stress responses also promotes metabolic shifts that encourage fat-gain along with an increase in inflammation which in turn is associated with increasing fat-gain. Also, detrimental changes occur in the microbiota of the gut and this could also encourage a trend towards adiposity.[42]

> Hyperactivation of stress responses also promotes metabolic shifts that encourage fat-gain

Research has demonstrated:

- In a study of 277 male workers, a strong association was found (even after adjustment for confounding influences such as age, gender, and calorie intake) between the amount of job stress and weight gain.[43]
- A 20-year study of 3872 men and women in Sweden found that stress from high job demands predicted ~30% increase in weight gain.[44]
- A significant relationship between work-related stress and weight gain has also been seen in a Norwegian cohort.[45]
- Parents of cancer patients are more likely to gain weight than parents of healthy children and the magnitude of weight gain is related to the degree of psychological distress that the parents experienced. Parents of cancer patients reported lower levels of physical activity, however, they also had lower caloric intake than parents of healthy children (the most marked differences between groups occurred in the area of physical activity).[46]

There has been some conflicting evidence though. In a study of 4,065 adolescents aged from 11 to 16, perceived stress in any year was not related to increases in waist circumference or BMI 1–4 years later, and there was no evidence that higher stress over the whole period was associated with greater gains in waist or BMI. However, waist and BMI were significantly higher in the moderate- and higher-stress groups than the lower-stress group across the whole 5-year period.[47]

In another review, this one of college-age adults, it was found that stress could result in movements of weight up or down, according to the individual.[48] This effect is likely to be due to behavioural and psychological tendencies and predisposition to anxiety and to whether the person is a habitual over- or undereater (and possibly whether they have other underlying metabolic disorders.)

> Stress could result in movements of weight up or down

The effects of stress on weight gain, especially given some of the unclear results, are also likely to be due to metabolic status and weight at baseline. In a study of 7965 British civil servants, in men, the effect of job strain on weight gain and weight loss was dependent on baseline BMI. In the leanest participants, stress was more likely to be related to weight loss, while those in the highest BMI group were more likely to gain weight (however, this effect wasn't seen in women).[49]

After extreme stress, post-traumatic stress disorder (PTSD) can result. PTSD has been associated with a range of negative food and weight interactions. In a cohort of nearly 34000 service people, PTSD was associated with both disordered eating behaviours (vomiting, laxative use, fasting, over-exercise) and weight gain.[50]

PTSD was associated with both disordered eating behaviours and weight gain

In a more recent study, PTSD was associated with weight gain in both male and female veterans post-deployment, of an additional ~100g of weight gained per year compared to those without PTSD.[51]

Does social support protect against stress-induced weight gain?

In college students, social support has been demonstrated to modulate the effects of stress-eating on weight gain and this effect was seen most especially in males.[52]

Summary

Stress has a bi-directional relationship with many systems of the body and factors of health. Because of this, stress is now a known factor implicated in weight gain due to effects of stress hormones and their interplay with fat storage, inflammation, and secondarily to 'stress-eating' which encourages both overconsumption of food and poorer food choices.

IN BRIEF

The Effects of Stress on Immunity

The effects of stress and immunity have recently been highlighted due to the increased prevalence of mental health challenges related to stress, increased workplace stress, and the impact on our psychosocial environment from the COVID-19 pandemic. It is clear from the evidence that stress impacts immunity and that conversely, stress-reduction can improve immunity. These findings are critical to our understanding of health and should receive more attention in the context of clinical and community care.

Work and life-stress impair immunity

A review of 56 studies published on work-stress and immunity concluded that higher job-stress, including high demands, low control, high strain, job dissatisfaction, poor effort-reward imbalance, overcommitment, burnout, unemployment, downsizing, and effects of recession impacted key immune markers (such as NK cell activity, NK and T cell subsets, CD4+/CD8+ ratio, and increased inflammatory markers).[53]

In particular, the *effort-reward imbalance* (i.e. how much reward you get from your work efforts) is associated with lowered immunity and workplace stress is also more commonly associated with lowered immunity than overcommitment, although both are associated with weakened immune responses.[54] For example, caregivers of dementia patients suffer poorer immune responses and this is considered to be as a result of the demands of their workplace stress.[55]

> the *effort-reward imbalance* is associated with lowered immunity

Prenatal stress is also reported to increase the risk of nervous, endocrine and metabolic diseases, and immune dysfunction. Prenatal stress is associated with changes in immune cells, cytokines, immune organs, and hematopoietic stem cells.[56]

Effects of stress-reduction on immunity

In a review of 75 studies, a moderate response was found for immune function changes resulting from stress-reduction techniques. This supports the idea that stress impacts immune function, and that conversely, stress-reduction can improve immunity.[57]

How Does Stress Drive Inflammation?

In this issue, we have looked at the effect of stress on immunity. Part of the immune-inflammatory cascade is the often talked about, but perhaps seldom properly understood concept of inflammation.

What is inflammation?

Inflammation is part of the body's normal response to damage from injury, irritants, and infection. It is a protective response of innate (not adaptive or pathogen-specific) immunity, involving immune cells, blood vessels, and inflammatory mediators. The main functions of inflammation are:

- Eliminate the cause of cell injury
- Clear damaged tissue and metabolic waste
- Trigger tissue repair

Inflammation is marked by the cardinal signs of *calor*, *dolor*, *rubor*, *tumor*, and *function laesa*, or heat, pain, redness, swelling, and loss of function.

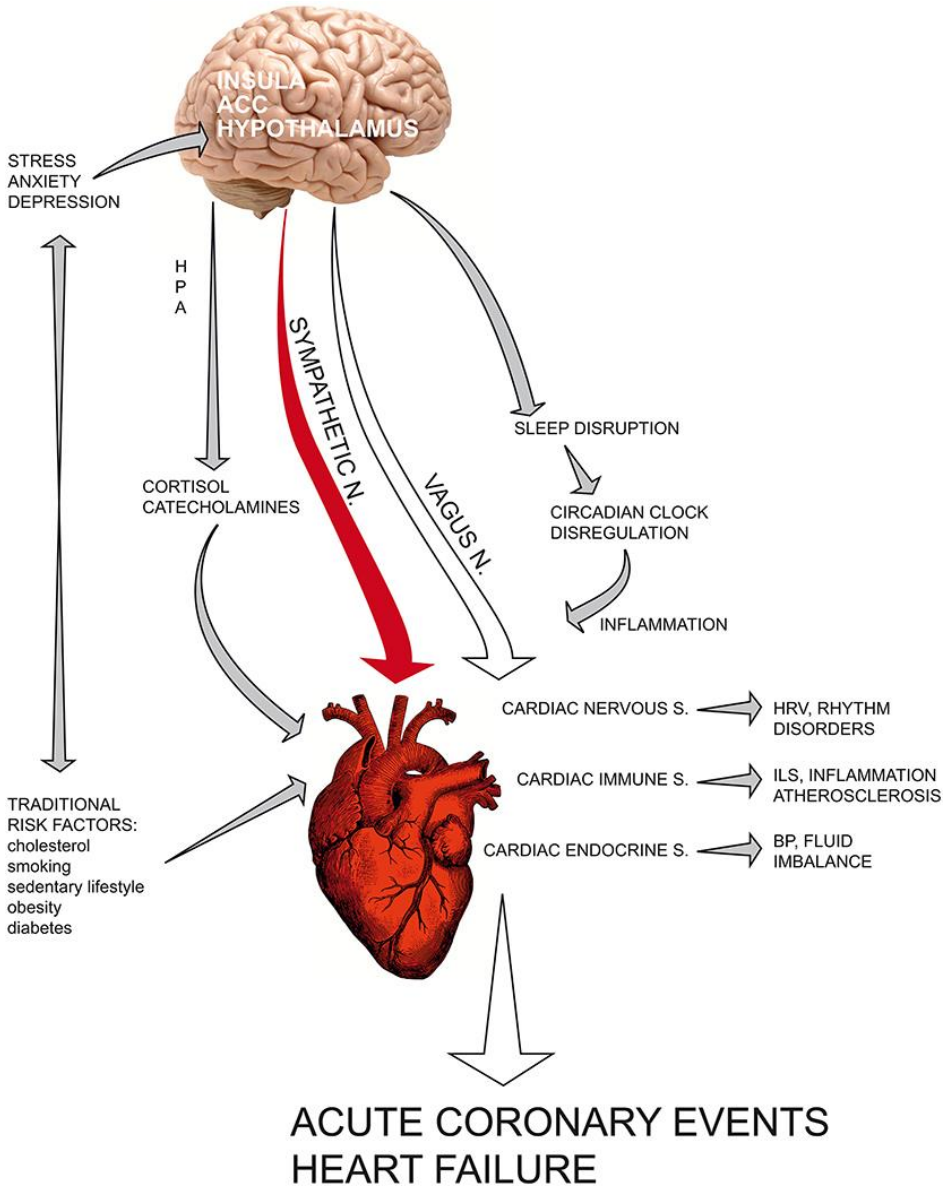
Inflammatory balance is important, as too little inflammation or an inability to properly initiate and maintain inflammatory responses promotes excessive tissue damage and an inability to repair. Conversely, chronic, excessive inflammation also results in damage and is associated with a range of diseases including allergy states, autoimmune conditions, cardiovascular disease, neurodegenerative disorders, and metabolic disorders like diabetes.

Stress and inflammation.

In response to physical stress, inflammatory processes occur. These can also occur in response to psychological stress.[58] Several stress-related illnesses are associated with increased inflammatory activity. For example, post-traumatic stress disorder (PTSD)[59-61] and chronic anxiety disorders are associated with increased levels of pro-inflammatory cytokines (especially interleukin-1β and tumour necrosis factor-α).[60] In PTSD, the resulting inflammation is thought to cause structural alterations to the brain, especially the amygdala, hippocampus, and frontal cortex, potentially resulting in further worsening of stress and emotional problems.[59]

Stress-driven inflammation also has an association with cardiovascular disease. Stress increases inflammatory markers such as c-reactive protein, and this measure of systemic inflammation has a better predictive value for risk of cardiovascular disease than either total or LDL cholesterol.[62]

Stress increases inflammatory markers such as c-reactive protein



From: https://www.frontiersin.org/articles/10.3389/fimmu.2018.02031/full?&utm_source=E

Stress is thought to play an important role in *neuroinflammation* or inflammation in the brain. Stress is marked by the release of various neurochemicals that activate the inflammatory cascade (via mast cells and other inflammatory cells). Further systemic stress results from this with the release of cortisol (driven by corticosteroid releasing factor) and there is an activation of the sympathetic nervous system ('fight or flight' system), the hypothalamic-pituitary axis (HPA), and secondary release of stress hormones including norepinephrine (adrenaline) and glucagon. These and other cytokines associated with stress initiate the other responses resulting in further stress-inflammation and might result in disturbances to gut-integrity and chronic inflammation.[58]

IN THE RESEARCH

Effects of macronutrient intake in obesity: a meta-analysis of low-carbohydrate and low-fat diets on markers of the metabolic syndrome

Anouk E M Willems, Martina Sura–de Jong, André P van Beek, Esther Nederhof, Gertjan van Dijk

Nutrition Reviews, nuaa044,

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Published: 04 September 2020

Abstract

The metabolic syndrome (MetS) comprises cardiometabolic risk factors frequently found in individuals with obesity. Guidelines to prevent or reverse MetS suggest limiting fat intake, however, lowering carbohydrate intake has gained attention too. The aim for this review was to determine to what extent either weight loss, reduction in caloric intake, or changes in macronutrient intake contribute to improvement in markers of MetS in persons with obesity without cardiometabolic disease. A meta-analysis was performed across a spectrum of studies applying low-carbohydrate (LC) and low-fat (LF) diets. PubMed searches yielded 17 articles describing 12 separate intervention studies assessing changes in MetS markers of persons with obesity assigned to LC (<40% energy from carbohydrates) or LF (<30% energy from fat) diets. Both diets could lead to weight loss and improve markers of MetS. Meta-regression revealed that weight loss most efficaciously reduced fasting glucose levels independent of macronutrient intake at the end of the study. Actual carbohydrate intake and actual fat intake at the end of the study, but not the percent changes in intake of these macronutrients, improved diastolic blood pressure and circulating triglyceride levels, without an effect of weight loss. The homeostatic model assessment of insulin resistance improved with both diets, whereas high-density lipoprotein cholesterol only improved in the LC diet, both irrespective of aforementioned factors. Remarkably, changes in caloric intake did not play a primary role in altering MetS markers. Taken together, these data suggest that, beyond the general effects of the LC and LF diet categories to improve MetS markers, there are also specific roles for weight loss, LC and HF intake, but not reduced caloric intake, that improve markers of MetS irrespective of diet categorization. On the basis of the results from this meta-analysis, guidelines to prevent MetS may need to be re-evaluated.[63]

Comment

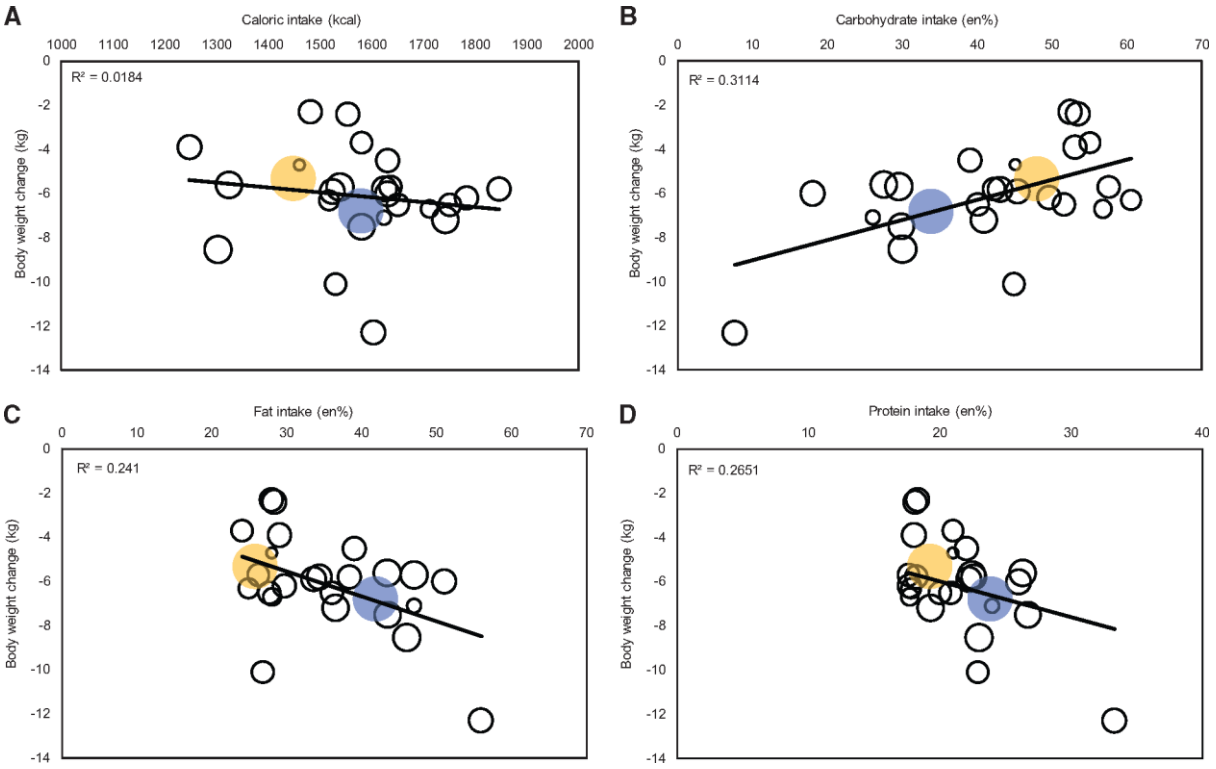
This was an interesting study because the authors chose to mostly look at the data as a continuum of macronutrients, rather than simply comparing the two types of diets. In

other words, the actual doses of carbohydrate and other macronutrients were compared across all studies in a linear regression analysis. This provides a unique insight into how actual intakes of macronutrients might affect cardiometabolic outcomes.

Some of the key points of interest were:

- Reducing carbohydrate was associated with weight loss with ~6-11% reduction in carbohydrate (as % of total energy) related to a 1 kg weight loss.
- Conversely, ~6-9% increase in fat intake was associated with 1 kg weight loss.
- Protein had the strongest effect with a 2-3% increase in protein associated with a 1 kg weight loss.

Note: Actual fibre intake, percent changes in macronutrient and saturated fat intake from baseline nor the absolute change in fibre intake were correlated with body weight loss at 6 and 12 months.



- Every 1 mmHg lowering in diastolic blood pressure was related to a 7.4% increase in fat intake and with 10.8% reduction in carbohydrate intake
- Every 1 mmol/L lowering in TAG levels related with 55.6% increase in actual fat intake and with 83.3% reduction in actual carbohydrate intake

These findings suggest that reducing the carbohydrate content of the diet, and increasing protein and fat, results in improved measures of cardiometabolic health, including weight, HDL cholesterol, diastolic blood pressure, and triglycerides.

Reducing the carbohydrate content of the diet, and increasing protein and fat, results in improved measures of cardiometabolic health

Effects of forest bathing on pre-hypertensive and hypertensive adults: a review of the literature

Katherine Ka-Yin Yau, Alice Yuen Loke

Environmental Health and Preventive Medicine volume 25,
Article number: 23 (2020)

Abstract

The aim in this literature review was (1) to explore the physiologically and psychologically therapeutic benefits of forest bathing on adults suffering from pre-hypertension or hypertension, and (2) to identify the type, duration, and frequency of an effective forest bathing intervention in the management of pre-hypertension and hypertension, so as to provide directions for future interventions or research. The electronic databases PubMed, Cochrane Library, CINAHL, PsyINFO, and the China Academic Journals (CAJ) offered through the Full-text Database (CNKI) were searched for relevant studies published from the inception of the databases to April 2019. Of the 364 articles that were identified, 14 met the criteria for inclusion in this review. The synthesis of the findings in the included studies revealed that forest bathing interventions were effective at reducing blood pressure, lowering pulse rate, increasing the power of heart rate variability (HRV), improving cardiac-pulmonary parameters, and metabolic function, inducing a positive mood, reducing anxiety levels, and improving the quality of life of pre-hypertensive or hypertensive participants. Forest walking and forest therapy programs were the two most effective forest bathing interventions. Studies reported that practicing a single forest walking or forest therapy program can produce short-term physiological and psychological benefits. It is concluded that forest bathing, particularly forest walking and therapy, has physiologically and psychologically relaxing effects on middle-aged and elderly people with pre-hypertension and hypertension.[64]

Comment

Hypertension is a risk factor for cardiovascular events and stroke and is results from a range of diet and lifestyle conditions including highly processed foods, excess calorie intake, stress, lack of sleep, and microbiota disturbances.

Hypertension is typically defined as > 140/90 mmHg. While the main interventions used are medication and limiting sodium intake, reductions in dietary salt (sodium) while consistently resulting in reduced blood pressure (i.e. a 'significant' finding) they do not result in meaningful reductions in blood pressure, except with extreme restriction likely to cause other adverse health effects. Exercise and other interventions are also useful for reducing blood pressure.

Everyday life stress has been demonstrated to cause meaningful and consistent elevations in blood pressure. 'Forest bathing' (Shinrin-yoku), or the spending of time in nature, especially in wooded areas, and being exposed to natural stimuli like tress, woods, flowers, fungi, and flowing water has demonstrated a range of positive effects on health. Previous research has demonstrated improvements in immune function, heart rate, blood pressure, inflammation, depression, and it might even help to protect against cardiovascular disease and cancer.

In this review, the following outcomes were highlighted:

- Reduced blood pressure (by around 5-15%)
- Reduced heart rates of 3-6%
- Possible reductions in cortisol
- Reduced inflammation
- Reduced depression and improved anxiety
- Improved mood and quality of life overall

During forest bathing, it is important to slow down and be mindful of your surroundings and how you are within those surroundings.

It is clear, based on the evidence that being surrounded by nature has a significant benefit to health when compared to urban environments (many of the studies reviewed compared urban to natural environment comparisons). Going for a daily walk in your local park or a natural area near your work or home is likely to provide appreciable health and quality-of-life benefits.

Being surrounded by nature has a significant benefit to health

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