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Center for Family Healthcare and Functional Wellness

SLEEP – *IS* the Treatment

Benefits of Sleep

- Improved glymphatic system function – besides waste elimination, facilitates brain-wide distribution of several compounds, including glucose, lipids, amino acids, growth factors, and neuromodulators[4]
- Hormonal/metabolic balance – reduced risk of obesity, diabetes and cardiovascular disease; emotional stability; enhanced executive, cognitive, visual, and spatial function (proprioception)
- Normalized sensitivity to pain; normalized reaction time

Consequences of Sleep Deprivation – *Deteriorated function and wellbeing*[1]

- impaired perception, poor concentration, vision disturbances, slower reactions[1]
- poor memorizing, wrong decisions, emotional disturbances, increased aggressiveness[1]
- heightened sensitivity to pain, hormonal disturbance – risk of obesity, diabetes and cardiovascular disease increases[1]; increased involuntary microsleeps and sleep attacks[3]
- performance impairment is comparable to ethanol intoxication at the level of 0.10% blood alcohol[1]

How to Sleep

- consistent sleep schedule – same bedtime and wake time *every* day, weekends included
- practice a relaxing bedtime ritual with reduced lights, noise, and visual stimulation
- darkened, cooled environment - absent of light and EMFs (electromotive forces) either from electronic or technological devices or any other light source, natural or artificial
- sleep horizontally – head at heart level or below, on a comfortable, supportive mattress
- review the recommendations from this website: sleepfoundation.org/sleep-tools-tips/healthy-sleep-tips

Supplements to Support Sleep

- Relora, Ashwaganda (*Withania somnifera*), 5-HTP, Vitamins $B_{3, 5, 6}$, Magnesium (I prefer magnesium malate for its brain supportive effects), L-Theanine, Passion Flower (Passiflora species), Phosphatidyl serine (PS), any number of calming herbal teas including but not limited to chamomile, lavender, hops, valerian, or try banana tea. Here is a site for the recipe: davidwolfe.com/banana-cinnamon-tea-deep-sleep/

1. Int J Occup Med Environ Health. 2010;23(1):95-114. doi: 10.2478/v10001-010-0004-9.

Consequences of sleep deprivation.

Orzeł-Gryglewska J[1].

This paper presents the history of research and the results of recent studies on the effects of sleep deprivation in animals and humans. Humans can bear several days of continuous sleeplessness, experiencing deterioration in wellbeing and effectiveness; however, also a shorter reduction in the sleep time may lead to deteriorated functioning. Sleeplessness accounts for impaired perception, difficulties in keeping concentration, vision disturbances, slower reactions, as well as the appearance of microepisodes of sleep during wakefulness which lead to lower capabilities and efficiency of task performance and to increased number of errors. Sleep deprivation results in poor memorizing, schematic thinking, which yields wrong decisions, and emotional

disturbances such as deteriorated interpersonal responses and increased aggressiveness. The symptoms are accompanied by brain tissue hypometabolism, particularly in the thalamus, prefrontal, frontal and occipital cortex and motor speech centres. Sleep deficiency intensifies muscle tonus and coexisting tremor, speech performance becomes monotonous and unclear, and sensitivity to pain is higher. Sleeplessness also relates to the changes in the immune response and the pattern of hormonal secretion, of the growth hormone in particular. The risk of obesity, diabetes and cardiovascular disease increases. The impairment of performance which is caused by 20-25 hours of sleeplessness is comparable to that after ethanol intoxication at the level of 0.10% blood alcohol concentration. The consequences of chronic sleep reduction or a shallow sleep repeated for several days tend to accumulate and resemble the effects of acute sleep deprivation lasting several dozen hours. At work, such effects hinder proper performance of many essential tasks and in extreme situations (machine operation or vehicle driving), sleep loss may be hazardous to the worker and his/her environment.

2. Neuropsychiatr Dis Treat. 2007 Oct; 3(5): 553–567.

Sleep deprivation: Impact on cognitive performance

Paula Alhola[1] and Päivi Polo-Kantola[2]

Today, prolonged wakefulness is a widespread phenomenon. Nevertheless, in the field of sleep and wakefulness, several unanswered questions remain. Prolonged wakefulness can be due to acute total sleep deprivation (SD) or to chronic partial sleep restriction. Although the latter is more common in everyday life, the effects of total SD have been examined more thoroughly. Both total and partial SD induce adverse changes in cognitive performance. First and foremost, total SD impairs attention and working memory, but it also affects other functions, such as long-term memory and decision-making. Partial SD is found to influence attention, especially vigilance. Studies on its effects on more demanding cognitive functions are lacking. Coping with SD depends on several factors, especially aging and gender. Also interindividual differences in responses are substantial. In addition to coping with SD, recovering from it also deserves attention. Cognitive recovery processes, although insufficiently studied, seem to be more demanding in partial sleep restriction than in total SD.

3. Semin Neurol. 2005 Mar;25(1):117-29.

Neurocognitive consequences of sleep deprivation.

Durmer JS[1], Dinges DF.

Deficits in daytime performance due to sleep loss are experienced universally and associated with a significant social, financial, and human cost. Microsleeps, sleep attacks, and lapses in cognition increase with sleep loss as a function of state instability. Sleep deprivation studies repeatedly show a variable (negative) impact on mood, cognitive performance, and motor function due to an increasing sleep propensity and destabilization of the wake state. Specific neurocognitive domains including executive attention, working memory, and divergent higher cognitive functions are particularly vulnerable to sleep loss. In humans, functional metabolic and neurophysiological studies demonstrate that neural systems involved in executive function (i.e., prefrontal cortex) are more susceptible to sleep deprivation in some individuals than others. Recent chronic partial sleep deprivation experiments, which more closely replicate sleep loss in society, demonstrate that profound neurocognitive deficits accumulate over time in the face of subjective adaptation to the sensation of sleepiness. Sleep deprivation associated with disease-related sleep fragmentation (i.e., sleep apnea and restless legs syndrome) also results in neurocognitive performance decrements similar to those seen in sleep restriction studies. Performance deficits associated with sleep disorders are often viewed as a simple function of disease severity; however, recent experiments suggest that individual vulnerability to sleep loss may play a more critical role than previously thought.

4. Neurochem Res. 2015 Dec;40(12):2583-99. doi: 10.1007/s11064-015-1581-6. Epub 2015 May 7.

The Glymphatic System: A Beginner's Guide.

Jessen NA[1], Munk AS[2], Lundgaard I[2], Nedergaard M[2].

The glymphatic system is a recently discovered macroscopic waste clearance system that utilizes a unique system of perivascular tunnels, formed by astroglial cells, to promote efficient elimination of soluble proteins and metabolites from the central nervous system. Besides waste elimination, the glymphatic system also facilitates brain-wide distribution of several compounds, including glucose, lipids, amino acids, growth factors, and neuromodulators. Intriguingly, the glymphatic system function mainly during sleep and is largely disengaged during wakefulness. The biological need for sleep across all species may therefore reflect that the brain must enter a state of activity that enables elimination of potentially neurotoxic waste products, including β-amyloid. Since the concept of the glymphatic system is relatively new, we will here review its basic structural elements, organization, regulation, and functions. We will also discuss recent studies indicating that glymphatic function is suppressed in various diseases and that failure of glymphatic function in turn might contribute to pathology in neurodegenerative disorders, traumatic brain injury and stroke.

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FOOD – Your ***GENETIC*** Template
(*You ARE what you eat!*)

Benefits of Food – *How do you define food?*

- Neuronal plasticity (aka, brain adaptation), emotional stability, mental fitness[5]
- Improved verbal communication[6], improved muscle/bone/joint strength, improved organ function, improved blood brain barrier/gut barrier function

Consequences of Food Deprivation – *Deteriorated function and structure*[5]

- Neurological disorders, cognitive impairment and mood disorders[5], obesity, leptin/insulin/cortisol resistance
- Connective tissue disorder, bone loss/malformation, muscle loss, chronic kidney disease, non-alcoholic fatty liver disease, congestive heart failure, leaky brain/gut from inflammation leading to inner and outer skin disorders[7]

How & What to Eat – *Variety matters for nutritional balance*

- only eat when hungry; inconsistent food choices is the key to variety in the diet, brain thrives on novelty
- eat the rainbow in the whole food form, include 3-5 servings of vegetation per meal (half of meal), 1 serving healthy protein source (either animal based or veg), 1 serving of healthy fat, consume more or less of these depending on your individual needs
- **eliminate:** sugar – all forms; processed products (these are not food) and foods
- eat in a relaxed, calming environment – allow ample time to digest before activity

Supplements to Support Nutritional Balance - ***GMP certified products!!!***

- Multivitamin/mineral including vitamin $K_{1\ \&\ 2}$, EPA/DHA (fish oil), Probiotics, Vitamin D
- Coenzyme vitamin B complex, magnesium (malate, citrate, threonate, succinate)
- Collagen or protein, greens/reds powder, alpha lipoic acid, resveratrol/pterostilbene
- Curcumin, EGCg, silymarin, beet root, vitamin C, natural vitamin E, selenium, beta-carotene, lutein/zeaxanthin, other carotenoids and flavonoids including cacao

Additional Resources *(just a few)*

- Designs For Health – Science Update Forum
  http://blog.designsforhealth.com/si-42214
- Linus Pauling Institute – Micronutrient Information Center
  http://lpi.oregonstate.edu/mic/
- Orthomolecular . org – Nutrients
  http://orthomolecular.org/nutrients/index.shtml
- DoctorYourself . com
  http://www.doctoryourself.com/
- Riordan Clinic – Learn

https://riordanclinic.org/journal-articles/#

- Natural Grocers – Nutrition & Health
  https://www.naturalgrocers.com/nutrition-and-health/

5. Nat Rev Neurosci. 2008 Jul;9(7):568-78. doi: 10.1038/nrn2421.

Brain foods: the effects of nutrients on brain function.
Gómez-Pinilla F[1].

It has long been suspected that the relative abundance of specific nutrients can affect cognitive processes and emotions. Newly described influences of dietary factors on neuronal function and synaptic plasticity have revealed some of the vital mechanisms that are responsible for the action of diet on brain health and mental function. Several gut hormones that can enter the brain, or that are produced in the brain itself, influence cognitive ability. In addition, well-established regulators of synaptic plasticity, such as brain-derived neurotrophic factor, can function as metabolic modulators, responding to peripheral signals such as food intake. Understanding the molecular basis of the effects of food on cognition will help us to determine how best to manipulate diet in order to increase the resistance of neurons to insults and promote mental fitness.

6. Mol Psychiatry. 2016 Oct 18. doi: 10.1038/mp.2016.168. [Epub ahead of print]
Folinic acid improves verbal communication in children with autism and language impairment: a randomized double-blind placebo-controlled trial.
Frye RE[1,2,3], Slattery J[2,3], Delhey L[2,3], Furgerson B[1], Strickland T[1], Tippett M[1,2], Sailey A[2,3], Wynne R[2,3], Rose S[2,3], Melnyk S[2,3], Jill James S[2,3], Sequeira JM[4], Quadros EV[4].

We sought to determine whether high-dose folinic acid improves verbal communication in children with non-syndromic autism spectrum disorder (ASD) and language impairment in a double-blind placebo control setting. Forty-eight children (mean age 7 years 4 months; 82% male) with ASD and language impairment were randomized to receive 12 weeks of high-dose folinic acid (2 mg kg-1 per day, maximum 50 mg per day; n=23) or placebo (n=25). Children were subtyped by glutathione and folate receptor-α autoantibody (FRAA) status. Improvement in verbal communication, as measured by a ability-appropriate standardized instrument, was significantly greater in participants receiving folinic acid as compared with those receiving placebo, resulting in an effect of 5.7 (1.0,10.4) standardized points with a medium-to-large effect size (Cohen's d=0.70). FRAA status was predictive of response to treatment. For FRAA-positive participants, improvement in verbal communication was significantly greater in those receiving folinic acid as compared with those receiving placebo, resulting in an effect of 7.3 (1.4,13.2) standardized points with a large effect size (Cohen's d=0.91), indicating that folinic acid treatment may be more efficacious in children with ASD who are FRAA positive. Improvements in subscales of the Vineland Adaptive Behavior Scale, the Aberrant Behavior Checklist, the Autism Symptom Questionnaire and the Behavioral Assessment System for Children were significantly greater in the folinic acid group as compared with the placebo group. There was no significant difference in adverse effects between treatment groups. Thus, in this small trial of children with non-syndromic ASD and language impairment, treatment with high-dose folinic acid for 12 weeks resulted in improvement in verbal communication as compared with placebo, particularly in those participants who were positive for FRAAs.

7. Clin Exp Allergy. Author manuscript; available in PMC 2016 Oct 1.
Higher maternal serum concentrations of nicotinamide and related metabolites in late pregnancy are associated with a lower risk of offspring atopic eczema at age 12 months
S El-Heis,[1] SR Crozier,[1] SM Robinson,[1,2] NC Harvey,[1,2] C Cooper,[1,2,4] HM Inskip,[1,2] Southampton Women's Survey Study Group, and KM Godfrey[1,2,3]

Background: Evidence that atopic eczema partly originates in utero is increasing, with some studies linking the risk of developing the condition with aspects of maternal diet during pregnancy. Nicotinamide, a naturally occurring nutrient that is maintained through the dietary intakes of vitamin B3 and tryptophan has been used in the treatment of some skin conditions including atopic eczema.Objective: To examine the relation of maternal serum concentrations of nicotinamide and related tryptophan metabolites to the risk of atopic eczema in the offspring.Methods: Within the UK Southampton Women Survey, infantile atopic eczema at ages 6 and 12 months was ascertained (modified UK Working Party Criteria for the Definition of Atopic Dermatitis). Maternal serum levels of kynurenine, kynurenic acid, anthranilic acid, tryptophan, nicotinamide and N1-methylnicotinamide were measured in late pregnancy by mass spectrometry, n=497 and related to the odds ratio of infantile atopic eczema.Results: Maternal nicotinamide and related metabolite concentrations were not associated with offspring atopic eczema at age 6 months. Higher concentrations of nicotinamide and anthranilic acid were, however, associated with a lower risk of eczema at age 12 months (odds ratios 0.69, 95% CI 0.53-0.91 /SD change, p=0.007 and 0.63, 0.48-0.83, p=0.001, respectively). The associations were robust to adjustment for potentially confounding variables.Conclusion and clinical relevance: This is the first study linking maternal serum concentrations of nicotinamide and related metabolites to the risk of atopic eczema in the offspring. The findings point to potentially modifiable maternal influences on this complex and highly prevalent condition.

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MOVEMENT – Your ***GENETIC*** Modifier

"Nutritious Movement – You are how you move"

Benefits of Movement – *How do you define movement?*

- Neuronal plasticity (aka, brain adaptation) and neurogenesis, emotional stability, mental fitness, improved verbal communication
- improved muscle/bone/joint strength, improved organ function, improved blood brain barrier/gut barrier function
- Modulate pain sensation; release brain based growth factors (esp BDNF)

Consequences of Movement Deprivation – *Deteriorated function and structure*

- Neurological disorders, cognitive impairment and mood disorders, obesity, leptin/insulin/cortisol resistance
- Connective tissue disorder – think fasciitis, bone loss/malformation, muscle loss, chronic kidney disease, non-alcoholic fatty liver disease, congestive heart failure, leaky brain/gut from inflammation leading to inner and outer skin disorders

How & When to Move – *Variety matters for nutritional movement balance*

- Inconsistency in movement choices is the key to variety in the movement 'diet', brain thrives on novelty
- Stand, walk, sit, squat, kneel, lay, crawl, jog/run – all on different surfaces with different levels of rigidity, texture, and incline to get your movement micronutrients by squishing and expanding ALL of your cells
- Move mindfully – using all of your senses, purposefully be aware of your inner and outer environments, focus on your breath too and adjust your movement as necessary
- **eliminate:** sedentary life habits; repetitive movement habits
- use active movement throughout the day while you are intending to be awake but allow your body the necessary time to warm up and cool down from daily movement, not just exercise
- do NOT exercise immediately upon waking or directly before going to bed – this disregulates the hormonal signaling from the autonomic nervous system aka stress adaptation system

Additional Resources

- *The Brain's Way of Healing* – Norman Doidge, MD
- Nutritious Movement - You are how you move https://nutritiousmovement.com/
- *Move Your DNA* – Katy Bowman
- BREAKING**MUSCLE** – The Art of Mindful Movement http://breakingmuscle.com/mind-body/the-art-of-mindful-movement

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