

# Impact of Nutrition on Sleep

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# Sleep and Nutrition

## *Sleep and health*

- **Influence of Food Choice on Sleep Quality**
- **Prescription sleep aids** are one of the treatment options for troubles initiating or maintaining sleep
  - CDC estimates 4% of the adult population (9 million people) use prescription sleep aids
  - However, long-term use of sleep aids has been linked to adverse outcomes in health
- **Nutritional interventions** are a relatively *unexplored* potential method for enhancing sleep

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## *Sleep and health*

- **Macronutrients** have the potential to influence neurotransmitters involved in the sleep-wake cycle
  - *Most nutritional interventions for improving sleep focus on increasing **serotonin production via dietary tryptophan***
- **Tryptophan > 5-HTP > Serotonin > Melatonin**
  - **Tryptophan** (Trp) is an essential, dietary amino acid
  - Trp is converted into 5-hydroxy-L-Tryptophan (5-HTP)
  - **5-HTP** is, in turn, converted into **serotonin**
  - The **pineal gland** in the brain synthesizes **melatonin** from serotonin

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## *Sleep and health*

- Challenge: Trp must compete with other large neutral amino acids LNAAs (e.g. tyrosine, leucine) for transport across the blood-brain barrier
- Two hypothesized methods to promote entry of Trp into the brain
  - 1. Increase the ratio of Trp, relative to LNAA**
    - Food protein with the highest Trp content and most favorable Trp:LNAA ratio is  $\alpha$ -lactalbumin, a whey protein
  - 2. Consume carbohydrates**
    - Consumption of carbohydrates releases insulin which promotes uptake of LNAAs into skeletal muscle, “freeing up” transportation space for Trp to the brain

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## *Sleep and health*

- The **purpose** of this study was to test a set of dietary predictors of sleep quality
- Participants completed a 48-item, electronic questionnaire comprised of:
  - ✓ Modified food frequency questionnaire (FFQ) adapted from the Multifactor Screener conceptualised by the National Cancer Institute
  - ✓ Pittsburgh Sleep Quality Index
  - ✓ Demographic items

*Means and Standard Deviations for Individual Food Frequency Questionnaire Food Choice Items and for Food Categories by Sleep Quality Group (N=270)*

Individual food choice items	M (SD)	Food Category	M (SD)		Total
			Good Sleep Quality (n=138)	Poor Sleep Quality (n=132)	
1. Eat hamburger meat, hot dogs, sausage (chorizo), steak, bacon, or ribs?	2.78 (1.18)	Unhealthy proteins	6.21 (1.95)	6.40 (2.00)	6.30 (1.97)
2. Eat grilled or fried chicken, chicken nuggets, chicken fried steak, fried pork chops, fried fish, or fish sticks?	3.52 (1.14)				
3. Eat baked or broiled fish, turkey, or chicken?	3.17 (1.25)	Healthy proteins	6.83 (1.85)	5.83 (1.92)	6.34 (1.95)
4. Eat peanuts or peanut butter, or other nuts such as pecans, walnuts, or almonds?	3.17 (1.35)				
5. Eat any kind of cheese, cheese spread, or cheese sauce? (Include cheese on pizza or in dishes such as tacos, enchiladas, lasagna, sandwiches, cheeseburgers, or macaroni and cheese.)	4.03 (1.31)	Unhealthy dairy	3.98 (1.37)	4.08 (1.24)	4.03 (1.30)
6. Drink any kind of milk? (Include chocolate or other flavored milk, milk on cereal, and drinks made with milk.)	3.16 (1.41)	Healthy dairy	6.04 (2.27)	5.53 (2.37)	5.79 (2.33)
7. Eat yogurt or cottage cheese or drink a yogurt drink? (Do not count frozen yogurt.)	2.56 (1.38)				

*Fit Statistics and Parameter Estimates for Binary Logistic Regression Model Predicting Sleep Quality (n=270)*

Predictor	<i>B</i>	<i>SE</i>	Wald Statistic	<i>p</i>	<i>OR</i>	95% CI
Constant	-0.969	1.055	0.844	0.358	0.379	
Unhealthy proteins	-0.046	0.076	0.372	0.542	0.955	[0.823, 1.107]
Healthy proteins	-0.383	0.083	21.441	<0.001	0.682	[0.580, 0.802]
Unhealthy dairy	0.084	0.108	0.611	0.435	1.088	[0.881, 1.344]
Healthy dairy	-0.115	0.064	3.229	0.072	0.892	[0.787, 1.010]
Unhealthy grains	0.010	0.059	0.027	0.870	1.010	[0.899, 1.134]
Healthy grains	0.115	0.061	3.563	0.059	1.122	[0.996, 1.264]
Fruits and vegetables	0.070	0.040	3.082	0.079	1.072	[0.992, 1.159]
Healthy beverages	-0.021	0.085	0.059	0.809	0.980	[0.829, 1.157]
Unhealthy beverages	0.045	0.061	0.554	0.457	1.047	[0.928, 1.180]
Empty calories	0.110	0.039	8.028	0.005	1.117	[1.035, 1.205]
Sleep confounding beverages	-0.037	0.046	0.667	0.414	0.963	[0.881, 1.054]

*Note.* Omnibus Test of Model Coefficients=45.132,  $p<0.001$ ; -2 Log Likelihood=329.035; Hosmer and Lemeshow Test=3.080,  $p=0.929$ ; Classification table overall percentage=65.6%; Nagelkerke's  $R^2=0.205$ .

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- Results suggested good quality sleepers consumed **healthy protein food choices** more frequently than participants with poor sleep quality
- The odds of poor sleep quality were 31.84% lower for each unit of increased frequency of healthy proteins consumed, when holding all other independent variables constant
- The category of healthy protein included baked or broiled fish ([tryptophan per 100 grams](#): 0.306), turkey (0.330), chicken (0.323), peanuts (0.263) or peanut butter (0.330), and other nuts such as pecans (.096), walnuts (0.318), or almonds (0.281)



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## *Sleep and health*

- Analysis also found the odds of poor sleep quality were 11.67% higher for each unit increase in frequency of healthy proteins consumed, when holding all other independent variables constant
- The category of empty calorie foods included chips, frozen dessert, pastries, cookies, cakes, candy, fast food, etc.
- There is little research explaining a relationship between empty calories and sleep quality
- Higher consumption of empty calories may be a **proxy measure of overall behavioral health choices**, whereby those that consume empty calories more frequently are less inclined to lead a healthy lifestyle which in turn impacts sleep quality