

BEYOND TRADITIONAL TREATMENTS: NEW FRONTIERS IN ADOLESCENT AND CHILD MENTAL HEALTH

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Integrative Psychiatrist
Driftless Integrative Psychiatry

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OBJECTIVES

- Integrate high-yield, evidence-informed non-medication approaches to address child and adolescent mental health needs.
- Identify potential candidates for ketamine-assisted therapy and discuss practical considerations for primary care providers.
- Define psychedelics and explain their potential therapeutic benefits and risks for children and adolescents.

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ROAD MAP

Overview
Sleep
ADHD
Depression
Psychedelics
Integrative psychiatry resources

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The Landscape

- Increasing use - **12% of children used complementary therapies in 2012**, with dietary supplements, yoga, fish oil, and melatonin seeing significant increases
- Need for open dialogue - **families are often reluctant to discuss with physicians** due to perceived disapproval or ignorance

Black LI, Clarke TC, Barnes PM, Stussman BJ, Nahin RL. Use of complementary health approaches among children aged 4-17 years in the United States. National Health Interview Survey, 2007-2012. Natl Health Stat Report. 2015 Feb 10;(78):1-19. PMID: 25671583; PMCID: PMC4562216.

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Integrative Psychiatry

- More tools
- Comprehensive informed consent
- Finding out why
- Building trust with patients
- Outside the silo of psychiatry - considering underlying causes of symptoms (think intersection between gut health, environmental health, infections/immune system function, and mental health)

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SLEEP

- Insomnia is prevalent among school aged children and adolescents
- No FDA approved medication for insomnia in children

Dewald-Kaufmann J, de Bruin E, Michael G. Cognitive Behavioral Therapy for Insomnia (CBT-I) in School-Aged Children and Adolescents. Sleep Med Clin. 2019 Jun;14(2):155-165. doi: 10.1016/j.jsmc.2019.02.002. Epub 2019 Apr 1. PMID: 31029183

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SLEEP

- Getting a good history
 - Falling asleep issues - anxiety (catastrophic thoughts around not sleeping?), caffeine, screens, naps during day, sleep hygiene
 - Staying asleep - depression, environmental factors, night terrors, sleep apnea
 - Nightmares / PTSD, normal childhood experience

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Assess for causes of sleep issues

- ADHD - Restless legs
- Obstructive sleep apnea
- Caffeine use
- Anxiety/Depression/Trauma
- Screen use/LED lights
- Environmental factors - too warm, noises

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TAKEAWAY 1

If at all possible,
address the underlying
cause of sleep issues!

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TAKEAWAY 2

Behavioral interventions
and lifestyle changes
over pills!

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ADHD / Restless legs connection

Restless legs (RLS) are more common in those with ADHD

- creepy-crawly feeling, "do your legs bother you?"
- Up to 44% of children + adolescents with ADHD vs 2-15% of general population of children + adolescents

Address by:

- Treating ADHD (later in presentation!)
- And considering risk factors...

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6316205/>; Cortese S, Konofal E, Lecendreux M, Arnulf I, Moren MC, Darra F, Dalia Bernardina B. Restless legs syndrome and attention-deficit/hyperactivity disorder: a review of the literature. *Sleep*. 2005 Aug 1;28(8):1007-13. doi: 10.1093/sleep/28.8.1007. PMID: 16218085.; Dosman C, Wilmans M, Zwaigenbaum L. Iron's role in paediatric restless legs syndrome - a review. *Paediatr Child Health*. 2012 Apr;17(4):193-7. doi: 10.1093/pch/17.4.193. PMID: 23543250; PMCID: PMC3381661.

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Risk factors for restless legs

Iron deficiency

- Low levels of ferritin, a protein that stores iron in the body, are even more strongly associated with RLS
- Check ferritin in patients with ADHD, especially if patient has other symptoms of iron deficiency
 - increasing ferritin to >50µg/L

• Magnesium deficiency

- Mag levels are hard to accurately measure
- Normal serum mag lab does not rule out moderate to severe deficiency
- RBC magnesium is more accurate

Sierra Montoya AC, Mesa Restrepo SC, Cuartas Arias JM, Cornejo Ochoa W. Prevalence and Clinical Characteristics of the Restless Legs Syndrome (RLS) in Patients Diagnosed with Attention-Deficit Hyperactivity Disorder (ADHD) in Antioquia. *Int J Psychol Res (Medellin)*. 2018 Jan-Jun;11(1):58-69. doi: 10.21500/20112084.3381. PMID: 32612771; PMCID: PMC7110177.

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Obstructive Sleep Apnea

Prevalence of OSA in children and adolescents: 1-12%
 More common in those who are obese or overweight
 Symptoms: Headaches, daytime fatigue and sleepiness

Recommendations:

- No standard screening tool
- Ask about sleep quality and quantity at every visit
- Clues: Frequent night awakenings, unusual sleep positions, signs of increased nighttime movements

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Caffeine

The half-life of caffeine in children and adolescents is shorter (2-3 hours) than in adults (5 hours), indicating a faster elimination rate.

Recommendations:

- Limit caffeine 6 hours prior to bedtime
- Avoid caffeine if possible - especially energy drinks

Johnston, C. S., O'Brien, M. D., & Wilens, T. E. (2013). Caffeine consumption in children and adolescents: A review. *Pediatrics*, 132(3), e837-e845.

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Environmental

- Consistent sleep schedule
- Complete darkness
- Limit screentime at least an hour before bed
- Cooler temps - 60-67 degrees F
- Exercise
- Wind-down routine

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CBT for Insomnia (CBTi)

- CBTi: Structured therapy that involves relearning how to sleep and sleep restriction
- RCTs in children and adolescents is limited. Data supports its effectiveness in adult insomnia.
- Small study n=39 adolescents (ages 14-17) with insomnia utilized Sleepio, a digital, self-directed CBTi program
 - sleep restriction noted to be most helpful

Cliffe B, Croker A, Denne M, Smith J, Stallard P. Digital Cognitive Behavioral Therapy for Insomnia for Adolescents With Mental Health Problems: Feasibility Open Trial; JMIR Ment Health 2020;7(3):e14842 doi:

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Blue light blocking glasses



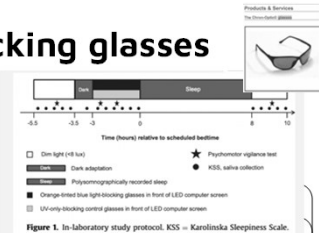
The research is **mixed and ongoing**. Possibly helpful.

The glasses are not standardized.

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Blue light blocking glasses

Swiss study (van der Lely et al., 2015): n=12, male adolescents ages 15-17. Cross over study wearing blue light blocking glasses and control of clear glasses while using screens in the evening



van der Lely S, Frey S, Garbaza C, Wirz-Justice A, Jenni OG, Steiner R, Wolf S, Cajochen C, Bromundt V, Schmidt C. Blue blocker glasses as a countermeasure for alerting effects of evening light-emitting diode screen exposure in male teenagers. *J Adolesc Health*. 2015 Jan;56(1):113-9. doi: 10.1016/j.jadohealth.2014.08.002. Epub 2014 Oct 3. PMID: 25287985.

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Blue light blocking glasses

Our data show that BB glasses can decrease LED screen-induced melatonin suppression and modulate subjective sleepiness and vigilance attention levels in the late evening hours in a sample of male adolescents. Compared with the control condition (CL glasses), our participants felt significantly more sleepy and less vigilant during the BB condition, although subsequent all-night sleep stage characteristics were not significantly altered. BB application can thus attenuate light-induced activating effects at the subjective and cognitive levels.

van der Lely S, Frey S, Garbazza C, Wirz-Justice A, Jenni OG, Steiner R, Wolf S, Cajochen C, Bromundt Y, Schmidt C. Blue blocker glasses as a countermeasure for alerting effects of evening light-emitting diode screen exposure in male teenagers. *J Adolesc Health*. 2015 Jan;56(1):113-9. doi: 10.1016/j.jadohealth.2014.08.002. Epub 2014 Oct 3. PMID: 25237985.

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Blue light blocking glasses

- Decrease in melatonin
- Increase in sleepiness at bedtime
- No difference in sleepiness in morning

The study did not find significant differences in sleep quality or duration between the teenagers wearing blue blocker glasses and those wearing clear glasses.

van der Lely S, Frey S, Garbazza C, Wirz-Justice A, Jenni OG, Steiner R, Wolf S, Cajochen C, Bromundt Y, Schmidt C. Blue blocker glasses as a countermeasure for alerting effects of evening light-emitting diode screen exposure in male teenagers. *J Adolesc Health*. 2015 Jan;56(1):113-9. doi: 10.1016/j.jadohealth.2014.08.002. Epub 2014 Oct 3. PMID: 25237985.

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Other Options to Decrease Blue Light Exposure

1. Limit exposure to screens after dusk but especially within 2-3 hours of bedtime
2. Screen filters: Night Shift (Apple devices) or f.lux (free download)
3. Use lower color temperature lights, 2000K to 3000K, ("warm white") and ranges from orange to yellow-white in appearance - or candles (1000k)

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Melatonin

- Found in animals and higher plants
- Ancient antioxidant, evolved to combat free radicals
- Synthesized at night in the pineal gland, precursor to serotonin
- Natural sleep aid

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Melatonin Overview

- Effective in improving sleep onset latency, sleep duration, and sleep quality in children with insomnia
- Particularly effective for delayed sleep phase disorder, jet lag, and irregular sleep-wake schedules.
- Generally considered safe for short-term use
- Long-term effects are unknown

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Melatonin and Autism

- ASMT gene polymorphism - linked to changes in melatonin production
- Prolonged release melatonin can help with frequent awakening

Zhou-yue Wu, Shu-dai Huang, Jin-Jun Zou, Qin-xin Wang, Muhammad Naveed, Hai-nan Bao, Wei Wang, Kohji Fukunaga, Feng Han (2020). Autism spectrum disorder (ASD): Disturbance of the melatonin system and its implications. *Biomedicine & Pharmacotherapy*. Schroder, C.M., Malow, B.A., Maras, A. et al. *Pediatric Prolonged-Release Melatonin for Sleep in Children with Autism Spectrum Disorder: Impact on Child Behavior and Caregiver's Quality of Life*. *J Autism Dev Disord* 49, 3218–3230 (2019). <https://doi.org/10.1007/s10803-019-04046-5>

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Melatonin and Autism

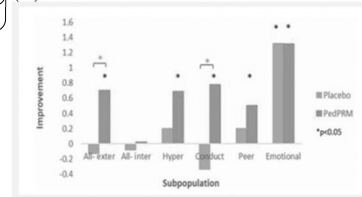
A 2021 double blind placebo controlled study, 13 week trial, ages 2-17 (n=80):

- Prolonged melatonin (PedPRM)
- The starting dose was 2 mg prolonged melatonin or matched placebo once-daily 30–60 min before habitual bedtime and after or with food

Schroder, C. M., Banaschewski, T., Fuentes, J., Hill, C. M., Hvolby, A., & Posselt, M. B. (2021). Pediatric prolonged-release melatonin for insomnia in children and adolescents with autism spectrum disorders. *Expert Opinion on Pharmacotherapy*, 22(18), 2445–2454.

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Melatonin and Autism



Also significant improvement in parent wellbeing compared to placebo that persisted throughout the 2 year follow up.

Schroder, C.M., Malow, B.A., Maras, A. et al. Pediatric Prolonged-Release Melatonin for Sleep in Children with Autism Spectrum Disorder: Impact on Child Behavior and Caregiver's Quality of Life. *J Autism Dev Disord* 49, 3218–3230 (2019). <https://doi.org/10.1007/s10803-019-04046-5>

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Melatonin

Regular melatonin dosing:

- 3-7 years old: 0.5-1 mg, 30-60 minutes before bedtime
- 7-12 years old: 1-3 mg, 30-60 minutes before bedtime
- 13-17 years old, 2-5 mg, 30-60 minutes before bedtime

Prolonged Release: Start with 2 mg 30-60 minutes before bedtime, if inadequate response increase to 5 mg or 10 mg. Dose can be increased every 2-3 weeks.

Side effects:

- Most common: Headaches (usually resolve on their own, are mild to moderate), daytime sleepiness

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Magnesium

- Supports GABA Function
- Inhibits Excitatory Neurotransmitters
- Regulates Stress Response via HPA axis
- Difficult to measure tissue stores with labs

Boomsma, D. (2008). The magic of magnesium. *International Journal of Pharmaceutical Compounding*, 12(4), 306-309. Nielsen, F. H., Johnson, L. K., & Zeng, H. (2010). Magnesium supplementation improves indicators of low magnesium status and inflammatory stress in adults older than 51 years with poor quality sleep. *Magnesium Research*, 23(4), 158-168. Schwalfenberg, G. K., & Genus, S. J. (2017). The Importance of Magnesium in Clinical Healthcare. *Scientifica*, 2017, 4179326. <https://doi.org/10.1155/2017/4179326>. <https://doi.org/10.1684/mrh.2010.0220>.

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Magnesium

- Existing research in children/adolescents: Limited and inconclusive. Small observational studies suggest a correlation between low magnesium and poor sleep.
 - Some may benefit, others may not
 - Studies have shown mixed results
- Risk/benefit conversation
- May help with restless legs, ADHD, migraines

Mehregan, A., Mohammadi, F., Najmifshari, Z., Aegari, S., Salehi, I. (2012). The effect of magnesium supplementation on sleep quality and attention in children with attention deficit hyperactivity disorder: a double-blind, randomized, placebo-controlled trial. *J Clin Neurosci*, 19(11), 906-10. (No significant sleep improvement in ADHD children with magnesium).
 Claes, S.J., Depoortere, I., Geurtsinck, F., Vanderlinden, L., Devresse, S. (2005). Oral magnesium for restless legs syndrome in children: a double-blind, randomized, placebo-controlled trial. *Neurology*, 64(11), 1805-10. (Modest sleep improvements in children with restless legs syndrome receiving magnesium.)

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L-theanine

Amino acid derived from green tea extract

Randomized Controlled Trial | Altern Med Rev. 2011 Dec;16(4):348-54.



The effects of L-theanine (Suntheanine®) on objective sleep quality in boys with attention deficit hyperactivity disorder (ADHD): a randomized, double-blind, placebo-controlled clinical trial

Michael R Lyon¹, Mahendra P Kapoor, Lekh R Juneja

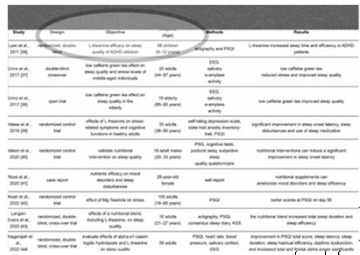
Affiliations + expand

PMID: 22214254

Kouchi, K., Mori, H., Oga, T., Kousaka, M., Suzuki, M., & Yamaguchi, H. (2012). The effects of L-theanine (Suntheanine®) on objective sleep quality in boys with attention deficit hyperactivity disorder (ADHD): A randomized, double-blind, placebo-controlled clinical trial. *Biological Psychology*, 89(1), 31-35. Mehregan, A., Mohammadi, F., Najmifshari, Z., Aegari, S., Salehi, I. (2012). The effect of magnesium supplementation on sleep quality and attention in children with attention deficit hyperactivity disorder: a double-blind, randomized, placebo-controlled trial. *J Clin Neurosci*, 19(11), 906-10.

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L-theanine studies

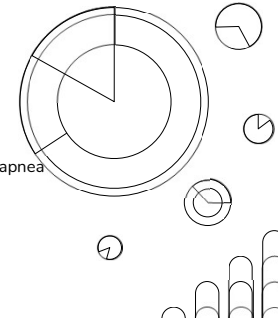


Author	Year	Design	Duration	Age	Interventions	Results
Lee et al. (2017)	2017	Randomized controlled	12 weeks	10 children	L-theanine effects on sleep quality and ADHD symptoms	L-theanine increased sleep time and efficiency in ADHD children
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Mehregan A, Mohammadi F, Najmafshari Z, Asgari S, Salehi I. (2012). The effect of magnesium supplementation on sleep quality and attention in children with attention deficit hyperactivity disorder: a double-blind, randomized, placebo-controlled trial. *J Clin Neurosci*, 19(11), 906-10.

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SLEEP REVIEW



Consider:
 Ruling out restless legs, obstructive sleep apnea
 ADHD
 Light blocking/limit screen time
 Caffeine
 Melatonin
 Magnesium
 L-theanine

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ADHD




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Why integrative approaches?

In a large study (n=78,849), **over half of subjects** (children and adolescents) with ADHD switch or discontinue medication within a year, with higher discontinuation rates among adolescents.

Little is known about the safety of extended administration of stimulants. Not effective 24 hours/day and can cause side effects

Schein J, Childress A, Adams J, Gagnon-Sanschagrin P, Maitland J, Qu W, Cloutier M, Guérin A. Treatment patterns among children and adolescents with attention-deficit/hyperactivity disorder in the United States - a retrospective claims analysis. *BMC Psychiatry*. 2022 Aug 18;22(1):555. doi: 10.1186/s12888-022-04188-4. PMID: 35982469; PMCID: PMC93387015.



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Nutrition

Micronutrient deficiencies may contribute to the pathophysiology of ADHD.

Home > Current Nutrition Reports > Article

Nutrition in the Management of ADHD: A Review of Recent Research

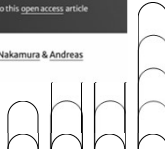
REVIEW | Open access | Published: 28 July 2023

Volume 12, pages 383–394, (2023) | [Cite this article](#)

[Download PDF](#) | You have full access to this open access article

Klaus W. Lange, Katharina M. Lange, Yukiko Nakamura & Andreas Reissmann

Lange, K.W., Lange, K.M., Nakamura, Y. et al. Nutrition in the Management of ADHD: A Review of Recent Research. *Curr Nutr Rep* 12, 383–394 (2023). <https://doi.org/10.1007/s13668-023-00487-8>

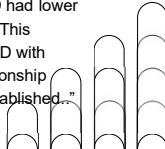


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Magnesium Deficiency and ADHD

Preliminary evidence points to its potential for ADHD symptoms

Deficiency and ADHD: "On the basis of seven studies, random effects meta-analysis showed that individuals with ADHD had lower serum magnesium concentrations than healthy controls. This finding supports the hypothesis of an association of ADHD with serum magnesium deficiency. However, the causal relationship between magnesium levels and ADHD remains to be established."



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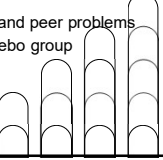
Magnesium

Study in BMC Pediatrics


RCT Placebo controlled study (n=66) Magnesium and vitamin D supplementation for 8 weeks improved behavioral issues in children with ADHD, indicating promising effects. Dose 6 mg/kg/day.

- Showed significant reductions in conduct, emotional, and peer problems as well as total difficulties in comparison with the placebo group

Hemamy, M., Pahlavani, N., Amanollahi, A. et al. The effect of vitamin D and magnesium supplementation on the mental health status of attention-deficit hyperactive children: a randomized controlled trial. *BMC Pediatr*. 21, 178 (2021). <https://doi.org/10.1186/s12887-021-02631-1>



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Magnesium

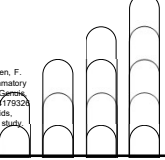
Dose:

- Optimal dosing is unknown.
- One study (Huss, 2010) found 80 mg helpful for ADHD but it was combined with zinc, Omega 3, and Omega 6's.


Different forms - pros/cons

- Magnesium citrate
- Magnesium glycinate*
- Magnesium oxide
- Magnesium L-threonate*

Boonmaa, D. (2008). The magic of magnesium. *International Journal of Pharmaceutical Compounding*, 12(4), 306-309. Nielsen, F. H., Johnson, L. K., & Zeng, H. (2010). Magnesium supplementation improves indicators of low magnesium status and inflammatory stress in adults older than 51 years with poor quality sleep. *Magnesium Research*, 23(4), 156-168. Schwalfenberg, G. K., & Gomez, S. J. (2017). The importance of Magnesium in Clinical Healthcare. *Scientifica*, 2017, 4179326. <https://doi.org/10.1155/2017/4179326>. <https://doi.org/10.1084/nmh.2010.0220>. Huss, M., Völp, A., & Skaus-Grabo, M. Supplementation of polyunsaturated fatty acids, magnesium and zinc in children seeking medical advice for attention-deficit/hyperactivity problems - an observational cohort study. *Lipids Health Dis* 9, 105 (2010). <https://doi.org/10.1186/1476-511X-9-105>.



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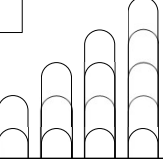
Magnesium

Other forms!

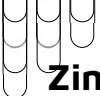
- Capsule
- Powder
- Gummies
- Epsom salt baths

Tip: Gummies will be most expensive and may contain the least amount of magnesium.

Mehregan A, Mohammadi F, Najmafshari Z, Asgari S, Salehi I. (2012). The effect of magnesium supplementation on sleep quality and attention in children with attention deficit hyperactivity disorder: a double-blind, randomized, placebo-controlled trial. *J Clin Neurosci*, 19(11), 906-10.



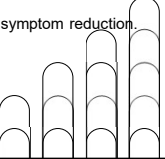
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
Zinc

- The relationship between zinc levels and ADHD has been explored, with mixed findings. Could partially improve ADHD severity.
- **Meta-analysis:** 6 RCTs involving 489 children found that zinc supplementation (10-40 mg daily for 6-12 weeks) **significantly improved overall ADHD scores**, with no clear dose-response relationship.
 - Longer zinc treatment duration seemed to lead to greater symptom reduction. Most studies involved Asian populations.
- Measuring zinc levels (serum) was often done in studies

Talebi S, Miraghajani M, Ghavami A, Mohammadi H. The effect of zinc supplementation in children with attention deficit hyperactivity disorder: A systematic review and dose-response meta-analysis of randomized clinical trials. *Crit Rev Food Sci Nutr*. 2021;1-10.



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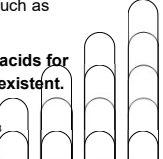


Omega 3 Fatty Acids

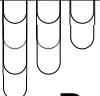
Mixed Results: Clinical trials investigating omega-3 supplementation in children and adolescents with ADHD have shown inconsistent outcomes. Some trials reported no significant benefit, while others observed improvements in specific behavioral measures such as impulsiveness and certain ADHD symptoms.

The evidence of therapeutic efficacy of Omega 3 fatty acids for ADHD core symptoms appears to be marginal or non-existent.

Lange, K.W., Lange, K.M., Nakamura, Y. et al. Nutrition in the Management of ADHD: A Review of Recent Research. *Curr Nutr Rep* 12, 383-394 (2023). <https://doi.org/10.1007/s13668-023-00487-8>



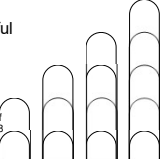
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Probiotics

- The findings in animal studies suggest that the gut microbiota may be a potential target for ADHD
- Relatively little is known of the role of different gut microbiota compositions in the predisposition for ADHD.
 - We don't know what specific organisms are helpful

Lange, K.W., Lange, K.M., Nakamura, Y. et al. Nutrition in the Management of ADHD: A Review of Recent Research. *Curr Nutr Rep* 12, 383-394 (2023). <https://doi.org/10.1007/s13668-023-00487-8>



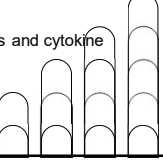
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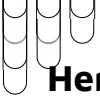
Probiotics

- Double blind RCT, n=32, drug naive children and adolescents ages 4-17 years old with diagnosis of ADHD
- Received probiotic strain *Lactobacillus rhamnosus* GG ATCC53103
- Findings:
 - Improved quality of life
 - Less conclusive improvement in ADHD symptoms and cytokine levels

Kumperscak HG, Gricar A, Ulen I, Micetic-Turk D. A Pilot Randomized Control Trial With the Probiotic Strain *Lactobacillus rhamnosus* GG (LGG) in ADHD: Children and Adolescents Report Better Health-Related Quality of Life. *Front Psychiatry*. 2020 Mar 17;11:181. doi: 10.3389/fpsy.2020.00181. PMID: 32256407; PMCID: PMC7092625.



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Herbal Options (Small Studies)


Small, positive studies showing effectiveness and tolerability for ADHD symptoms in children:

- Ginkgo biloba tablet 80-120 mg/day (placebo study, took with MPH, n=31. Another study found it less effective than MPH.
- Bacopa monnieri (Ayurvedic medicine), 225 mg daily (no placebo, ages 6-12, n=27)
- Pycnogenol 1 mg/kg/day (n=44, ages 6-14, had control)
- Passionflower (also helpful for anxiety, insomnia, n=34 children, dose of 0.04 mg/kg/day BID dosing with control of MPH. Both showed significant benefit

Golsorkhi H, Qorbani M, Sabbaghzadegan S, Dadmehr M. Herbal medicines in the treatment of children and adolescents with attention-deficit/hyperactivity disorder (ADHD): An updated systematic review of clinical trials. *Avicenna J Phytomed*. 2023 Jul-Aug;13(4):338-353. doi: 10.22038/AJP.2022.21115. PMID: 37663386; PMCID: PMC10474921.



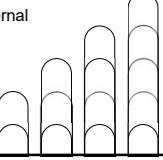
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Dietary Patterns

- Dietary patterns and lifestyle factors play a significant role in managing ADHD.
- Maternal diet quality during pregnancy and early childhood diet may influence ADHD symptoms in children - maternal diet perhaps even moreso

Borge, T.C., Biele, G., Papadopoulou, E. et al. The associations between maternal and child diet quality and child ADHD – findings from a large Norwegian pregnancy cohort study. *BMC Psychiatry* 21, 139 (2021). <https://doi.org/10.1186/s12888-021-03130-4>



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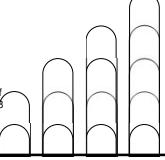
Dietary Patterns

Sugar consumption


Studies highlight the adverse effects of high sucrose intake but **show no direct link to ADHD incidence**

It's worth getting kids off processed foods and food dyes if possible.

Lange, K.W., Lange, K.M., Nakamura, Y. et al. Nutrition in the Management of ADHD: A Review of Recent Research. *Curr Nutr Rep* 12, 383–394 (2023). <https://doi.org/10.1007/s13668-023-00487-6>



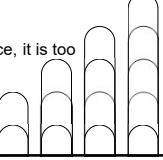
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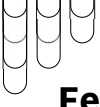
Food Dyes

- 2012 meta-analysis of food coloring additives had an association with ADHD. An estimated 8% of children with ADHD may have symptoms related to synthetic food colors.
 - They also found that restriction diets reduced ADHD symptoms, response rate was 33%
- "Although the evidence is too weak to justify action recommendations absent a strong precautionary stance, it is too substantial to dismiss"

Nigg JT, Lewis K, Edinger T, Falk M. Meta-analysis of attention-deficit/hyperactivity disorder or attention-deficit/hyperactivity disorder symptoms, restriction diet, and synthetic food color additives. *J Am Acad Child Adolesc Psychiatry*. 2012 Jan;51(1):86-97.e8. doi: 10.1016/j.jaac.2011.10.015. PMID: 22178942; PMCID: PMC4321796.



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Few Foods/Oligoallergenic Diet

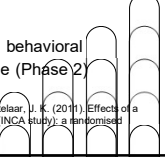
INCA Study (Pelsser et al, 2011):

First phase: 5 week restricted elimination diet (Few Foods Diet) vs instructions for healthy diet (control)

Double blind cross-over phase -

- Of the 50 subjects, 32 were responders (78% showed behavioral improvement) and were eligible for the Food Challenge (Phase 2)

Pelsser, L. M., Frankena, K., Toorman, J., Saveikoul, H. F., Dubois, A. E., Pereira, R. R., ... & Buitelaar, J. K. (2011). Effect of a restricted elimination diet on the behaviour of children with attention-deficit hyperactivity disorder (INCA study): a randomised controlled trial. *The Lancet*, 377(9764), 494-503.



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After Phase 1 (before reintroduction of foods)

	ADHD rating scale				Conners				ADHD symptom			
	Mean	SD	95% CI	p-value	Mean	SD	95% CI	p-value	Mean	SD	95% CI	p-value
ADHD rating scale	45.2	11.1	32.9-57.5	<.0001	52.4	11.1	40.3-64.5	<.0001	1.7	0.73	0.23-2.2	<.0001
Teacher ADHD rating scale	45.2	10.8	33.0-57.4	<.0001	52.4	11.1	40.3-64.5	<.0001	1.7	0.73	0.23-2.2	<.0001
Parent ADHD rating scale	45.2	10.8	33.0-57.4	<.0001	52.4	11.1	40.3-64.5	<.0001	1.7	0.73	0.23-2.2	<.0001
Teacher Conners	52.4	11.1	40.3-64.5	<.0001	52.4	11.1	40.3-64.5	<.0001	1.7	0.73	0.23-2.2	<.0001
Parent Conners	52.4	11.1	40.3-64.5	<.0001	52.4	11.1	40.3-64.5	<.0001	1.7	0.73	0.23-2.2	<.0001
Teacher ADHD symptom	1.7	0.73	0.23-2.2	<.0001	1.7	0.73	0.23-2.2	<.0001	1.7	0.73	0.23-2.2	<.0001
Parent ADHD symptom	1.7	0.73	0.23-2.2	<.0001	1.7	0.73	0.23-2.2	<.0001	1.7	0.73	0.23-2.2	<.0001

Pelsser, L. M., Frankena, K., Toorman, J., Savelkoul, H. F., Dubois, A. E., Pereira, R. R., ... & Buitelaar, J. K. (2011). Effects of a restricted elimination diet on the behaviour of children with attention-deficit hyperactivity disorder (INCA study): a randomised controlled trial. *The Lancet*, 377(9764), 494-503.

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Few Foods/Olligoallergenic Diet

- Helpful for assessing whether ADHD symptoms are caused by individual foods
- IgG testing not helpful for ADHD
- Seems to be a food sensitivity issue, not a food allergy
- Also helpful for ODD

Pelsser, L. M., Frankena, K., Toorman, J., Savelkoul, H. F., Dubois, A. E., Pereira, R. R., ... & Buitelaar, J. K. (2011). Effects of a restricted elimination diet on the behaviour of children with attention-deficit hyperactivity disorder (INCA study): a randomised controlled trial. *The Lancet*, 377(9764), 494-503.

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Clinical considerations: Elimination Diet

- Inform parents of risks including risk of continued ADHD symptoms
- Generally should collaborate with dietician
- 2-4 weeks duration, strict adherence
- Use weekly rating scales (ie 10 item Connors ADHD index)

Nigg JT, Holton K. Restriction and elimination diets in ADHD treatment. *Child Adolesc Psychiatr Clin N Am*. 2014 Oct;23(4):937-53. doi: 10.1016/j.chc.2014.05.010. Epub 2014 Aug 10. PMID: 25220094; PMCID: PMC4322780.

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Clinical considerations: Elimination Diet

- Few Foods Diet:
 - Rice, meat, vegetables, pears, and water
 - Include reintroduction, one at a time - most important part
- Less restrictive route: avoiding food dyes

Nigg JT, Holton K. Restriction and elimination diets in ADHD treatment. *Child Adolesc Psychiatr Clin N Am*. 2014 Oct;23(4):937-53. doi: 10.1016/j.chc.2014.05.010. Epub 2014 Aug 10. PMID: 25220094; PMCID: PMC4322780.

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Food additives to avoid

- All artificial colors
- All artificial flavors
- All artificial sweeteners, including aspartame, acesulfame K, neotame, saccharin, sucralose
- Sodium benzoate
- Butylated hydroxyanisole and Butylated hydroxytoluene
- Carrageenan
- Monosodium or monopotassium glutamate
- Any hydrolyzed, textured, or modified protein

Nigg JT, Holton K. Restriction and elimination diets in ADHD treatment. *Child Adolesc Psychiatr Clin N Am*. 2014 Oct;23(4):937-53. doi: 10.1016/j.chc.2014.05.010. Epub 2014 Aug 10. PMID: 25220094; PMCID: PMC4322780.

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ADHD REVIEW

- Elimination diet or at minimum, trial without food dyes
- Magnesium - may help
- Exercise
- Zinc - mixed results
- Omega 3s - marginal efficacy
- Herbs - may be beneficial (gingko, pycnogenol, bacopa, passionflower)
- *Lactobacillus rhamnosus* GG ATCC53103 - improves quality of life

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DEPRESSION

Root causes

Diet

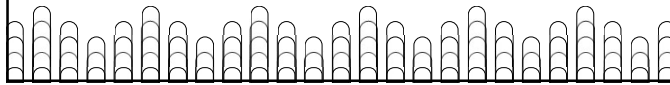
Exercise

Omega 3 fatty acids

Vitamin/mineral deficiencies

Bright light therapy

Psychedelics



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Considerations

Hormone fluctuations - luteal phase mood changes, bloating, cramping

Thyroid dysfunction - fatigue, weight gain, mood swings, cold intolerance

Iron deficiency - fatigue, difficulty concentrating, change in sleep patterns, anhedonia

Psychological trauma - nightmares, sympathetic overdrive

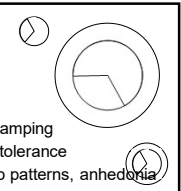
Genetics

Celiac disease - chronic diarrhea, constipation, bloating, abdominal pain, fatigue, skin rashes, pale skin

Biochemistry - vitamin and mineral deficiencies, food sensitivities, gut microbiome imbalances, infections

Lifestyle - **sleep**, exercise, diet, connection

Role of environment - societal stressors, climate change, screens/social media



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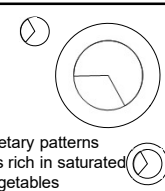
Depression and Diet

Increased risk of depression in adolescents: Western dietary patterns (sweetened beverages, processed/ junk food, and foods rich in saturated fatty acids), along with low consumption of fruits and vegetables

Evidence in adult studies is focused on:

- Mediterranean diet/ traditional dietary pattern
- More plants
- Seafood/omega 3s
- Microbiome/fermented foods
- B vitamins
- Limit highly processed foods

Zielińska M, Luszczki E, Michońska I, Dereń K. The Mediterranean Diet and the Western Diet in Adolescent Depression-Current Reports. *Nutrients*. 2022 Oct 19;14(20):4390. doi: 10.3390/nu14204390. PMID: 36297074; PMCID: PMC9610762.

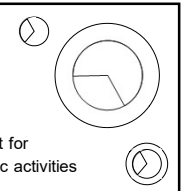


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Exercise

- Exercise shows promise as an alternative treatment for depression in children and adolescents, with aerobic activities being the most beneficial.
- Intervention programs with a frequency of three times per week, 40-50 minutes over an average duration of 12 weeks demonstrate small to medium positive effects on depressive symptoms.

Wegner, M., Amatriain-Fernández, S., Kaulitzky, A., Murillo-Rodriguez, E., Machado, S., & Budde, H. (2020). Systematic review of meta-analyses: Exercise effects on depression in children and adolescents. *Frontiers in psychiatry*, 11, 507452. Chicago, IL: Zhou X, Huang Z, Shao T. Effect of exercise intervention on depression in children and adolescents: a systematic review and network meta-analysis. *BMC Public Health*. 2023 Oct 4;23(1):1918. doi: 10.1186/s12889-023-16824-z. PMID: 37794338; PMCID: PMC10552327.



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Supplement Overview

Omega 3s, Vitamin D have the most robust evidence

St. John's Wort - no RCTs. Most commonly prescribed medication in Germany for child and adolescent depression. Studies have had high drop out rates. Not particularly effective for mod to severe depression. Can't be taken with SSRIs.

SUMMARY OF EVIDENCE									
DIET	CLASS	AGE	NO. OF STUDIES	STUDY DESIGN	INTERVENTION	COMPARISON	OUTCOME MEASUREMENT	CLINICAL SCALE	PROPOSED DOSE
Omega-3	Adult	18-65	75	RCTs	1000-4000 mg daily	Placebo	Modest	Modest	2-4 g daily
St. John's Wort	Adult	18-65	10	RCTs	300 mg daily	Placebo	Modest	Modest	300 mg daily
Vitamin D	Adult	18-65	10	RCTs	2000 IU daily	Placebo	Modest	Modest	2000 IU daily
SAMe	Adult	18-65	3	RCTs	1200 mg daily	Placebo	Modest	Modest	1200 mg daily
Bacopa	Adult	18-65	1	RCT	300 mg daily	Placebo	Modest	Modest	300 mg daily
Probiotics	Adult	18-65	10	RCTs	Various	Placebo	Modest	Modest	Various
Vitamin C	Adult	18-65	10	RCTs	500-2000 mg daily	Placebo	Modest	Modest	500-2000 mg daily
Vitamin E	Adult	18-65	10	RCTs	400-1600 IU daily	Placebo	Modest	Modest	400-1600 IU daily
Zinc	Adult	18-65	10	RCTs	50-100 mg daily	Placebo	Modest	Modest	50-100 mg daily

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Omega 3 Fatty Acids

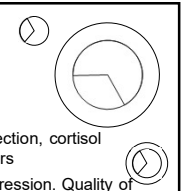
Anti-inflammatory, increase synaptic plasticity, neuroprotection, cortisol regulation, indirectly contribute to making neurotransmitters

Two RCTs done (2006, 2012). - improved severity of depression. Quality of evidence is low. Other studies have been mixed.

Risks: large capsules (liquid form available), side effects of GI upset, headaches, increased bleeding risk

Dose for children/adolescents: 1 to 2 g per day with a 2:1 ratio of EPA to DHA

- Rosenberg, D., & Gershon, S. (2012). *Pharmacotherapy of child and adolescent psychiatric disorders*. John Wiley & Sons.
- Nemets, H., Nemets, B., Apter, A., Bracha, Z., & Belmaker, R. H. (2006). Omega-3 treatment of childhood depression: A controlled, double-blind pilot study. *The American Journal of Psychiatry*, 163(6), 1098-1100.



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Vitamin D and Mental Health

Vitamin D may improve mental health by crossing the blood-brain barrier, activating brain cell receptors, exhibiting anti-inflammatory properties, modulating neurotrophic signaling, and exerting neuroprotective effects.

Esnafoglu, E., & Ozturan, D. D. (2020). The relationship of severity of depression with homocysteine, folate, vitamin B12, and vitamin D levels in children and adolescents. *Child and adolescent mental health, 25*(4), 249-255; Xie, F., & Huang, T. (2022). Effect of vitamin D supplementation on the incidence and prognosis of depression: An updated meta-analysis based on randomized controlled trials. *Frontiers in public health, 10*, 903547.

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Vitamin D

Small study (Esnafoglu, Ozturan, 2020): n=89. Children with DSM 5 MDD were found to have lower levels of Vitamin D and Vitamin B12 and had elevated levels of homocysteine.

Meta-analysis of RCTs (2021): Positive impact of vitamin D on children's mental health, enhancing behavior, mood, and well-being. Highlights the need for adequate vitamin D through diet, supplementation, or sun exposure. For the vast majority of included studies, both intervention and observational ones, the results supported beneficial association between Vitamin D and mental health.

Esnafoglu, E., & Ozturan, D. D. (2020). The relationship of severity of depression with homocysteine, folate, vitamin B12, and vitamin D levels in children and adolescents. *Child and adolescent mental health, 25*(4), 249-255; Xie, F., & Huang, T. (2022). Effect of vitamin D supplementation on the incidence and prognosis of depression: An updated meta-analysis based on randomized controlled trials. *Frontiers in public health, 10*, 903547; Glińska D, Kolota A, Lachowicz K, Skolmowska D, Stachon M, Guzek D. The Influence of Vitamin D Intake and Status on Mental Health

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Vitamin D

Ref.	Potential Influence of Vitamin D	Quality
[173]	Reduced pain, fatigue, and depression, as well as improved depressive symptoms	Supporting
[142]	Reduced depressive symptoms	Supporting
[143]	Reduced depressive symptoms and anxiety	Supporting
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Glińska D, Kolota A, Lachowicz K, Skolmowska D, Stachon M, Guzek D. The Influence of Vitamin D Intake and Status on Mental Health in Children: A Systematic Review. *Nutrients.* 2021 Mar 16;13(3):952. doi: 10.3390/nu1303952. PMID: 33809478; PMCID: PMC7995324.

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Bright Light Therapy

2024 study (Ballard et al) - n=9

Positive effect noted - depression scores decreased, sleep efficiency increased significantly

Poor adherence

Low risk/well-tolerated

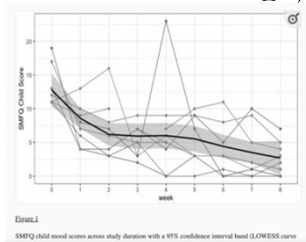
Light box used: Carex DayLight Classic Model

Overall lack of well-powered studies in children/adolescents

Ballard R, Parkhurst JT, Gadek LK, Julian KM, Yang A, Pasetes LN, Goel N, Sit DK. Bright Light Therapy for Major Depressive Disorder in Adolescent Outpatients: A Preliminary Study. *Clocks Sleep.* 2024 Jan 30;6(1):56-71. doi: 10.3390/clocksleep6010005. PMID: 38390946; PMCID: PMC10885037.

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Bright Light Therapy



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Bright Light Therapy

Who is most likely to respond?

Seasonal variations in mood

Atypical depressive symptoms - increased appetite, weight gain, hypersomnia, reflection sensitivity, fatigue

Ballard R, Parkhurst JT, Gadek LK, Julian KM, Yang A, Pasetes LN, Goel N, Sit DK. Bright Light Therapy for Major Depressive Disorder in Adolescent Outpatients: A Preliminary Study. *Clocks Sleep.* 2024 Jan 30;6(1):56-71. doi: 10.3390/clocksleep6010005. PMID: 38390946; PMCID: PMC10885037.

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Bright Light Therapy

Tips:

- Brightness: 10,000 lux
- 12" away from face, full exposed to light
- Ideally in the morning
- 30 minutes/day
- UV light filter

Ballard R, Parkhurst JT, Gadek LK, Julian KM, Yang A, Pasotes LN, Goel N, Sit DK. Bright Light Therapy for Major Depressive Disorder in Adolescent Outpatients: A Preliminary Study. *Clocks Sleep*. 2024 Jan 30;6(1):56-71. doi: 10.3390/clocksleepp6010005. PMID: 38390946; PMCID: PMC10885037.

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DEPRESSION REVIEW

Consider other contributing causes

Increase plant foods such as vegetables, fruits, whole grains, nuts, seeds, and legumes, fish

Aerobic exercise three times a week, 40-50 min

Omega 3 FA - effective

Vitamin D - effective

Bright light therapy - am or afternoon okay, especially helpful for atypical depression

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Neuromodulation / Novel Treatments for Depression

Ketamine

- We have good evidence in the adult population that ketamine is very helpful for treatment resistant depression, suicidal ideation and also for anxiety, trauma, eating disorders, and chronic pain. Research in adolescents is in its early stages and non-existent in children.
- A recent large double-blind randomized controlled trial demonstrated that 63% of adults receiving ketamine achieved sustained remission of suicidality (n = 17) using a single dose of 0.5 mg/kg of IV ketamine and assessment over 2 weeks

Other psychedelics in the pipeline...psilocybin, MDMA - no studies in children or adolescents

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Ketamine

- NMDA glutamate antagonist - increases glutamatergic activity
- Considered a psychedelic medicine
- Increased glutamatergic activity impacts neural signaling, synaptic plasticity, and connectivity
- Routes of administration: IM, IV, intranasal (IN), sublingual
- Rapid antidepressant effect

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Ketamine confusion

- Esketamine vs racemic ketamine
- For mental health, it is utilized in various settings - biomedical, therapy models, both at home and in person

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How Ketamine Differs from other Psychedelics

- Shorter duration of action: 30 min to 1 hour 15 min
- Plays well with other drugs
 - No life threatening drug-drug interactions (compared to Ayahuasca, for example)
 - Hold lamotrigine, naltrexone, benzodiazepines, stimulants (dampen effect)
- Legal for clinical use in the US

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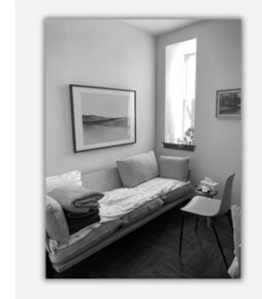
Safety

- Numerous clinical studies of ketamine for anesthesia and procedural sedation in children and adolescents indicating its safety
- Used in pain studies - continuous use of IV ketamine for pain for 4-14 consecutive days without significant side effects, at higher doses
- Most common side effects: dizziness, nausea/vomiting, headache

Wolfson PE, Andries J, Ahlers D, Whippo M. Ketamine-assisted psychotherapy in adolescents with multiple psychiatric diagnoses. *Front Psychiatry*. 2023 Mar 30; 14:1141988. doi: 10.3389/fpsyg.2023.1141988. PMID: 37055866; PMCID: PMC1008149.

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Set/Setting



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When is Ketamine considered?

- Often families and adolescents seek out ketamine therapy if they have tried multiple other psychiatric treatments and didn't find benefit or weren't tolerated
- Esketamine - insurance coverage for treatment resistant depression (TRD) with suicidality in adults. Not FDA approved for children/adolescents.
- Ketamine in its general adult application has come to have far greater diagnostic indications than TRD
 - Rigid thought patterns, negative self beliefs, processing trauma
 - Patient is committed to process and open to exploring non-ordinary states of consciousness

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Research

- In a DB RCT (Dwyer et al, 2021) 17 adolescents ages 13-17 with severe MDD and without suicidal ideation or substance use disorders received either a single IV infusion of ketamine (0.5 mg/kg over 40 min) or midazolam.
 - Single ketamine infusion reduced depression scores 24 hours after infusion (MADRS score decreased from mean of 33.1 to 15.4 compared to midazolam (24.1))
- Cullen et al, 2018: n=13, ages 14-18 with TRD were administered six ketamine infusions over two weeks (0.5 mg/kg). Clinical response seen in 38%. Sustained benefits noted in 3 of the 5 responders after 6 weeks.
- Autism spectrum disorder (ASD) and ketamine are in early exploration with a report of safety and tolerability of intranasal ketamine in 14-29-year-olds and a single patient report of a dramatic brief remission of the core symptoms of autism

Dwyer JB, Landeros-Weisenberger A, Johnson JA, et al. Efficacy of intravenous ketamine in adolescent treatment-resistant depression: a randomized midazolam-controlled trial. *Am J Psychiatry* 2021; 178:352-362. Cullen KR, Amaya P, Roback MG, et al. Intravenous ketamine for adolescents with treatment-resistant depression: an open-label study. *J Child Adolesc Psychopharmacol* 2018; 28:437-444. Kasher T, Walsh K, Shuman L, Alam H, Wood S. Ketamine and the core symptoms of autism. *Int J Disabil Hum Dev*. (2016) 15:121-3. 10.1515/ijdh-2015-0003

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Research

Meta-analysis (Di Vincenzo et al, 2021) - assessing safety, tolerability, and efficacy of ketamine for adolescents

- Limitations: small quantity, high heterogeneity, and generally low quality of available studies
- Found:
 - Two case reports in adolescents assessed measures of suicidal ideation and both found ketamine to effectuate rapid anti-suicidal effects
 - Ketamine appears to be safe and well-tolerated in adolescents

Di Vincenzo, J. D., Siegel, A., Lipetz, O., Ho, R., Teopiz, K. M., Ng, J., Lui, L. M. W., Lin, K., Cao, B., Rodrigues, N. B., Goh, H., Montoya, R. S., & Rosenblatt, J. D. (2021). The effectiveness, safety and tolerability of ketamine for depression in adolescents and older adults: a systematic review. *Journal of Psychiatric Research*, 137(May), 232-241.

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Case Study

- Andy, a 14 year old boy with complex self-destructive behavior, active suicidal ideations, high reactivity to father's verbal abuse and rages, and mother's passivity
 - Two antidepressant failures - TRD
 - Low BMI/anorexia (120lbs, 5'9")
 - 3 suicide attempts, frequent cutting
- HAM-A score of 35, BDI 47
- Course:
 - Started with sublingual troches, 100 mg x 2. Increased by 50 mg in second dose. Third dose included IM.

Dwyer JB, Landeros-Weisenberger A, Johnson JA, et al. Efficacy of intravenous ketamine in adolescent treatment-resistant depression: a randomized midazolam-controlled trial. *Am J Psychiatry* 2021; 178:352-362. Cullen KR, Amaya P, Roback MG, et al. Intravenous ketamine for adolescents with treatment-resistant depression: an open-label study. *J Child Adolesc Psychopharmacol* 2018; 28:437-444.

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Case Study

- Intention: "I would like to understand my depression and be done with it"
- Increasing his autonomy and self-worth and moving to a position of recognizing the cost to himself and the futility of his self-destruction.
- Outcomes:
 - His impulses to cut and abstain from eating continued but with less pressure.
 - Now at one year without cutting episode. This has become a source of pride for Andy.
 - There are still occasional thoughts of self-harm but none of suicide.
 - Andy has successfully matriculated into a prestigious high school

Dwyer JB, Landeros-Weisenberger A, Johnson JA, et al.: Efficacy of intravenous ketamine in adolescent treatment-resistant depression: a randomized midazolam-controlled trial. *Am J Psychiatry* 2021; 178:352-362. Cullen KR, Amaty P, Roback MS, et al.: Intravenous ketamine for adolescents with treatment-resistant depression: an open-label study. *J Child Adolesc Psychopharmacol* 2018; 28:437-444

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Case Study

- Other benefits:
 - The understanding and acceptance that facilitates self-regulation, and a deeper sense of trust in his own judgment and behavior.
- There were no significant adverse effects. Tapering of ketamine's use has been without withdrawal or cravings
- Was an effective intervention for bingeing, cutting, suicidal ideation

Dwyer JB, Landeros-Weisenberger A, Johnson JA, et al.: Efficacy of intravenous ketamine in adolescent treatment-resistant depression: a randomized midazolam-controlled trial. *Am J Psychiatry* 2021; 178:352-362. Cullen KR, Amaty P, Roback MS, et al.: Intravenous ketamine for adolescents with treatment-resistant depression: an open-label study. *J Child Adolesc Psychopharmacol* 2018; 28:437-444

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Case Study: Patient's Comments

After having multiple in-office ketamine sessions and occasionally taking the at home[sic] ketamine tablets, I have noticed a major reduction (to the point of non-existent) in suicidal thoughts, tendencies, and urges. I have noticed a major reduction (to the point of non-existent) in self harm[sic] thoughts, tendencies, and urges. A major reduction in depressive feelings and depressive mood. Overall better wellbeing feeling.

There were no difficulties in[sic] the medicine apart from nausea on 2[sic] separate occasions. I did not find difficulty in the journey experience but rather found it to be enjoyable and I found being able to navigate through it to be quite helpful and with relative ease.

I would definitely do this treatment again. I would also highly recommend this treatment to anyone who is troubled by depression, suicide, or self-harm aspects in their life.

I had absolutely no trouble reducing or stopping ketamine use.

Wolfson PE, Andries J, Ahlers D, Whippo M. Ketamine-assisted psychotherapy in adolescents with multiple psychiatric diagnoses. *Front Psychiatry*. 2023 Mar 30;14:1141988. doi: 10.3389/fpsy.2023.1141988

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Clinical Tips: Ketamine

- Typically recommend 2-6 sessions
- Most studies recommend 2 sessions in 3 weeks for acute, severe mental health symptoms
 - Can be spaced out
- Patients can advocate for their therapists to be present during or schedule therapy sessions before and after.
- Refer to clinics that have therapists or providers with formal mental health training

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Other Psychedelic Therapy

- Minimal research regarding psychedelics and kids/adolescents
- Their effects on the developing brain are not well understood
- Future potential applications:
 - Severe PTSD
 - Treatment resistant depression
 - Social anxiety caused by autism
 - Pediatric palliative care

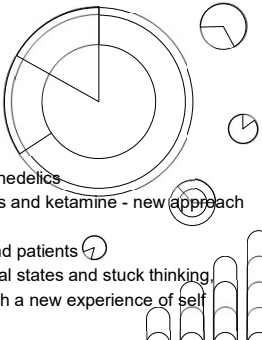
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Other Psychedelic Therapy

- Psilocybin-assisted therapy approved for clinical use in OR, CO in adults ages 18+ in licensed facilities
- Ketamine is the only legal psychedelic in all 50 states, when used clinically

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PSYCHEDELICS REVIEW



- No research regarding children and psychedelics
- Emerging research regarding adolescents and ketamine - new approach for depression, suicidality
- Requires careful preparation for family and patients
- Potentially allow for relief from obsessional states and stuck thinking, allowing for a new approach to life through a new experience of self

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INTEGRATIVE PSYCHIATRY RESOURCES

Supplement info

- www.examine.com
- <https://naturalmedicines.therapeuticresearch.com/>
- Fullscript supplement online dispensary - 35% off MSRP

Learning opportunities

- Integrative Psychiatry Institute
- University of AZ, Integrative Pediatric Neurology: ADHD & Autism online course
- PANS/Autism - Neuroimmune Foundation



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THANK YOU!

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