



Promoting Mental Health and Wellness in Youth Through Physical Activity, Nutrition, and Sleep

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KEYWORDS

- Mental health • Wellness • Exercise • Sports • Nutrition • Diet • Sleep
- Child and adolescent

KEY POINTS

- From 3 to 5 days of moderate to vigorous aerobic exercise for 45 to 60 minutes confers benefits to youth physical and mental wellness. Additional benefits are seen with sports participation.
- Nutritional patterns that are high in a variety of fruits and vegetables, whole grains, seafood, and nuts, moderate in low-fat dairy products, low in red meat, and very limited in processed foods, saturated and trans fats, added sugars, and sodium have been associated with improved mental health outcomes across the lifespan.
- Following age-appropriate recommendations for sleep duration is associated with improvements in mental health and well-being. Engaging in consistent and calming bedtime routines, creating a restful and comforting sleep environment, and ensuring that children's physical and emotional needs are met during the daytime can increase the likelihood of obtaining adequate sleep duration.
- Seligman's PERMA (positive emotions, engagement, relationships, meaning, and accomplishment) model is a useful construct to approach improving physical activity, eating, and sleep to yield improved physical and mental wellness in youth.

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INTRODUCTION

Approximately 1 in every 4 to 5 youth in the United States meet criteria for a mental disorder with severe impairment before they reach adulthood.¹ Improving health care and implementing practices to decrease vulnerability to psychiatric symptoms is a vital part of treatment of this population. Conventional first-line treatments such as cognitive behavior therapy (CBT) and psychopharmacology may be moderately effective, but too often fail to improve some symptoms, with medications carrying a risk for serious side effects.^{2,3} Alternative or augmenting treatment interventions such as incorporating physical activity, improving nutrition, and optimizing sleep allow clinicians to fashion a more comprehensive approach to mental health treatment of youth.

The landscape of youth mental health and wellness is evolving as providers increasingly view interventions through a more holistic lens. Although many research studies have shown the benefits of physical activity, nutrition, and sleep in youth, few studies show how these factors interact with emotional health and wellness. The existing research in this area is largely cross-sectional, which precludes a demonstration of causality, and is also limited by researchers' use of heterogeneous protocols and measurements, small sample sizes, and nonclinical participants. These methodological limitations highlight the complexity involved with researching such dynamic variables and interactions. Given the lack of a robust evidence base, it is difficult to standardize recommendations, particularly in relation to physical activity and nutrition. However, the existing research studies suggest that optimizing physical activity, nutrition, and sleep confers numerous benefits for youth mental health and wellness, and exerts a positive impact on the developmental trajectory of young people vulnerable to, or struggling with, psychiatric disorders.

PHYSICAL ACTIVITY AND SPORTS

Clinical Relevance and Current Research

A significant body of research shows that being more physically active has significant benefits for everyone, regardless of age, sex, race, ethnicity, or current fitness level.⁴ The US Department of Health and Human Services recommends that preschool-aged children (ages 3–5 years) be physically active throughout the day to enhance growth and development, and children and adolescents aged 6 to 17 years should engage in 60 minutes or more of physical activity each day (with 3 days a week including muscle-strengthening and bone-strengthening each), with most of the 60 minutes being of moderate-intensity or vigorous-intensity aerobic physical activity, to enhance physical wellness.⁴ Although this level of physical activity yields improved cardiorespiratory and muscular fitness, stronger bones, healthier metabolic biomarkers, and more favorable body composition, only 20% of US high school students meet these guidelines.⁴ A growing body of literature suggests that physical activity also yields mental health and wellness benefits, although precise recommendations for type, amount, and frequency remain elusive.

There are small to moderate positive associations between physical activity and positive mental health traits, including social-emotional and academic functioning in youth, as summarized in [Table 1](#).

Similarly, improving physical activity can also confer benefits to youth at risk for, or with, certain psychiatric symptoms and disorders, as summarized in [Table 2](#).

Participation in organized and/or competitive sports offers a unique gateway to physical activity. Children can engage in sports either as an individual or as a member of a team, although individual sports have been found to yield fewer psychological

Domain of Benefits	Trait	Clinical Implications
Social-Emotional	<ul style="list-style-type: none"> • Enhanced self-concept^{a,5} • Increased life skills^{a,5} • Improved self-esteem^{a,5} • Protective for shy children^{a,b,5} 	<ul style="list-style-type: none"> • Improved self-perception and value of own qualities and abilities • More likely to express confidence in self • Increased engagement in novel activities and/or new situations • By learning to tolerate distress, can challenge self further, and reap benefits when overcoming new tasks
Academic	<ul style="list-style-type: none"> • Improved classroom behavior, with decreased disruptive behaviors⁶ • Improved academic achievement⁶ • Cognitive and metacognitive benefits including learning, memory, attention management, and processing speed^{4,7-9} 	<ul style="list-style-type: none"> • Improvements in grades and test scores⁶ • Reduce the likelihood of negative classroom behaviors⁶ • Greater confidence in school-based tasks • Improved ability to attend to academic and daily tasks (eg, homework, quizzes, tests)⁶

^a Associations seen with sports participation.

^b As measured by decreased reports of anxiety symptoms.

benefits, and significantly fewer social benefits than team participation.⁵ Children who are active in sports are more likely to be physically active in adulthood, which is critically important because more physically active adults lead physically and emotionally healthier lives.^{5,23}

How It Works

The mechanisms of action by which physical activity and sports confer benefits to different domains of mental health and wellness are multifactorial, but they tend to be in 2 broad categories: neurobiological and psychosocial. Although the neurobiological cannot be separated from the psychosocial, and vice versa, conceptualizing it in this way can be helpful, as summarized in [Table 3](#).

Clinical Assessment

Before recommending physical activity or sports as part of a therapeutic intervention, it is important to clarify what the child is already doing, the child's activity preferences, and potential obstacles to being physically active. The answers to these questions may prompt further inquiry if, for example, the clinician suspects that the child is exercising too much in the context of an eating disorder or too little because of ongoing medical issues. Sample questions to help in the assessment of children's physical activity are listed in [Table 4](#). It is important to ask these of the parent and child if possible, because there can be discrepancies that are important to address. These questions can be modified to be asked directly of the child as the clinical context allows.

Recommendations for Physical Activity

Clinicians should consider prescribing physical activity as a way of promoting both physical and emotional health in youth, especially given the increasing evidence

Table 2 Associations between physical activity and psychiatric disorders	
Depression and suicidality	<ul style="list-style-type: none"> • Protective effect against depression across age, gender, and geographic regions across the world¹⁰ • Treatment effect sizes similar to that of antidepressant and CBT therapy for depressive symptoms in children and adolescents^{2,11–13} • Lower odds of sadness, suicidal ideation, or suicidal attempts in high school students^{a,14} • Reduction in suicidal ideation and attempts in bullied high school students^{a,15} • Decreased suicidal ideation and intention in adolescents involved with team sports^{b,9} • Decreased hopelessness, depression, and suicidality among college students¹⁶ • Inverse bidirectional association between depressive symptoms and physical activity (ie, increased physical activity precedes decreased depressive symptoms, and increased depressive symptoms precede decreased physical activity)¹⁷
ADHD	<ul style="list-style-type: none"> • Improvements in core ADHD symptoms (inattention, hyperactivity, and impulsivity)^{c,3} • Improved social, motor, behavioral, and emotional functioning^{d,18} • Physical activity in adolescence may decrease ADHD symptoms in early adulthood¹⁹
Anxiety	<ul style="list-style-type: none"> • May improve symptoms of anxiety in children and adolescents⁶ • Decreased social anxiety with lowered social isolation^{5,9}
Substance use	<ul style="list-style-type: none"> • Lower levels of alcohol, cigarette, and marijuana use among high school students^{e,20}
Psychosis and antipsychotic use	<ul style="list-style-type: none"> • Decreased physical activity and poorer cardiorespiratory fitness have been seen in adolescents who develop a psychotic illness²¹ • Lower measures of adiposity and improved insulin resistance in children treated with a second-generation antipsychotic^{f,22}

Abbreviation: ADHD, attention-deficit/hyperactivity disorder.

^a In high school students who exercised 4 to 5 d/wk compared with those who exercised 0 to 1 d/wk.

^b Benefits were lost when they discontinued playing sports.

^c Effects seen primarily with aerobic exercise.

^d Effects seen in medicated and unmedicated children with ADHD.

^e Although team sports were associated with higher levels of alcohol and smokeless tobacco use, physical activity mitigated some of the effects between team sports and alcohol use. Physical activity and being on a team were both shown to decrease cigarette and marijuana use.²⁰

^f Seen in children who met a minimal recommendation for daily physical activity compared with those who did not.

⁹ Associations seen with sports participation.

regarding the negative health impact of sedentary behaviors, with US children spending approximately 7.7 h/d (55% of their monitored waking time) being sedentary.⁴

As discussed earlier, it is difficult to draw conclusions regarding optimal types or “doses” of physical activity for mental health benefits given the overall heterogeneous nature of the research and lack of methodologically rigorous studies. However, common trends among the data across mental health and wellness domains suggest that to obtain the mental health benefits, physical activity in youth should involve:

- At least 45 to 60 minutes of physical activity each day^{2,4,10,14,18}
- From 3 to 5 days a week of moderate to vigorous aerobic activity^{2,4,10,14,18}

Table 3 Means by which physical activity and sports may confer benefits to youth mental wellness	
Conceptual System	Mechanism of Action
Neurobiological	<ul style="list-style-type: none"> • Modify inflammatory and oxidative stress responses¹⁰ • Promote neurogenesis, synaptogenesis, myelination, and angiogenesis to aid brain development through neurotrophic factors (such as BDNF)^{2,3,10,24} • Modulate monoamines (serotonin, dopamine, norepinephrine), endorphins, and endocannabinoids^{2,3,10,24} • HPA axis regulation²
Psychosocial	<ul style="list-style-type: none"> • Behavioral activation with positive reinforcement² • Satisfy basic psychological needs for social connectedness and autonomy²⁴ • Mastery of a skillset^{2,24} • Promote confidence through achievement^{2,24} • Exposure to difficult situations and using distress tolerance • Increasing overall self-efficacy and self-concept²

Abbreviations: BDNF, brain-derived neurotropic factor; HPA, hypothalamic-pituitary-adrenal.

Table 4 Example questions of parents when assessing physical activity in youth in the context of a mental health evaluation	
Example Questions	
Type	<ul style="list-style-type: none"> • What types of activities or sports does your child participate in? • Are these activities mostly aerobic (eg, running, swimming, soccer) or anaerobic (eg, push-ups/sit-ups, weight lifting, tug-of-war)?
Frequency	<ul style="list-style-type: none"> • How many days in a week does your child exercise or play sports? • What does your child do during "spare time"? • How consistently is the child exercising or staying physically active? (eg, spurts every so often, only during a sports season)
Duration	<ul style="list-style-type: none"> • How many minutes does your child exercise on average each day/week? • Do you have any worries that your child exercises too much? If yes, why do you think so?
Intensity	<ul style="list-style-type: none"> • When your child is exercising or playing sports, is the intensity most comparable with walking, jogging, or running? • Does your child usually end up sweating? • Is your child breathing hard during some, most, or all of the activity?
Preferred exercise	<ul style="list-style-type: none"> • What is your child's favorite way to be physically active? • Does your child prefer to play sports alone or on a team? • What have you seen your child enjoy most while engaged in physical activity?
Obstacles to physical activity	<ul style="list-style-type: none"> • Is there anything keeping your child from being more physically active? • Are there any medical concerns regarding your child being more physically active? • Does your child have appropriate strength and motor coordination? • Any concerns for bullying when your child is playing/practicing physical activities? • What other activities compete with time for physical activities? (eg, screen time, hanging out)
Supporting questions	<ul style="list-style-type: none"> • How has physical activity altered your child's nutrition? • How has physical activity affected your child's sleep? • Do you believe that your child is able to appropriately recover from the physical activity?

- Understanding that it might take at least 8 weeks of engagement before recognizing most benefits, although short-term benefits may be seen after as little as 1 bout of physical activity^{2,4,10,14,18}

Fortunately, these guidelines align with the physical activity recommendations for youth from the US Department of Health and Human Services. **Table 5** summarizes clinical considerations when increasing physical activity and selecting appropriate activities for youth, adopted from the US Department of Health and Human Services' Physical Activity Guidelines for Americans, 2nd edition.⁴

The most important role a provider can play is to guide the exploration for an appropriate and enjoyable physical activity for a child, especially in younger children, in whom physical activity can be introduced as "play," and establishing an active lifestyle may yield benefits throughout a lifetime. Similarly, encouraging a child's participation in organized sports can be helpful in the right context, and may provide mental health benefits beyond increased physical activity alone. By fostering a best-fit activity, clinicians can yield improved compliance in the subset of youth who may otherwise have ambivalence or disinterest preventing them from participating. To further address ambivalence regarding participation, clinicians can use motivational interviewing techniques focusing on the goals, values, and interests of the child.

NUTRITION SCIENCE

Clinical Relevance and Current Research

A global obesity epidemic (United States currently ranked #1 in childhood obesity rates [12.7%]) has called attention to the need for intervention in multiple domains, including diet and nutrition.²⁵ Emerging evidence argues the case for nutritional awareness not only for its effects on physical health, but also because of its relationship with mental health and well-being. Much of the investigation historically has focused on the role of individual nutrients on mental health. For example, magnesium,²⁶ zinc,²⁷ and omega-3 fatty acids²⁸ have been studied in relation to anxiety and depression.

However, recent focus has broadened the scope to considering dietary patterns. Data that support an association between unhealthy patterns of eating and poor mental health (eg, depression, anxiety), as well as healthy patterns of eating and improved mental health, are emerging for all stages of life. **Table 6** summarizes major findings, including 1 adult randomized control trial, the Supporting the Modification of lifestyle In Lowered Emotional States (SMILES) trial.⁴¹

How It Works

Multiple pathways have been proposed in the association between diet and mental health, including (but not limited to) inflammation,⁴² oxidative stress,⁴³ and changes in brain structure.⁴⁴ For example, unhealthy diet patterns have been associated with lower left hippocampal volume in animal and human studies, as well as the reverse for adults with healthy diet patterns, possibly mediated via brain-derived neurotrophic factor.^{29,45}

In addition, although in early stages, there has been growing interest in the gut microbiome (the approximately 100 trillion microorganisms that exist in the gastrointestinal tract) and its relationship with mental health.⁴⁶ The gut microbiome has been noted to be a virtual organ, producing metabolites that influence the host in many ways, with emerging evidence showing cross-influence with multiple systems, including neurobehavioral, metabolic, immune, and endocrine systems.⁴⁷ Although most data regarding the microbiota gut-brain connection currently come from animal models, human studies are emerging.^{46,48,49}

Table 5
Clinical considerations when increasing and selecting physical activities for youth

	Clinical Consideration	Clinical Example/Recommendations
Increasing Physical Activity	Start early	<ul style="list-style-type: none"> • Encourage play at home and in the neighborhood • Provide time for structured and unstructured physical activity in and out of school • Promote activities the child can enjoy for a lifetime (eg, swimming, cycling)
	Start low, go slow	<ul style="list-style-type: none"> • Risk of injury is directly related to the gap between usual level of activity and a new level of activity. Keep the gap small, allowing the body to adapt • Use the child's level of fitness to guide the level of effort expected • First, increase the number of minutes (duration) of an activity, then the number of days (frequency), then increase from moderate to vigorous intensity • Can add light-intensity to moderate-intensity activities (eg, short walk) to weekly routine • Increase activity by small amounts every week or two for youth (considering age, level of fitness, and level of experience) • Keep activities enjoyable • Vary activities to avoid muscle overuse injuries
	Medical clearance	<ul style="list-style-type: none"> • Although medical clearance should not be necessary for most children, periodic monitoring and collaboration with relevant providers may be appropriate for children with known medical conditions that may be adversely affected by rigorous exercise^{3,4}
	Replace sedentary behavior with activity when possible	<ul style="list-style-type: none"> • Replace TV watching after school with sports participation • Encourage walking or biking when possible instead of driving • Limit and replace screen time with family activities and outside games
Choosing a Physical Activity by Age and Aerobic Intensity ^a	Preschool-aged children	<ul style="list-style-type: none"> • Moderate intensity <ul style="list-style-type: none"> ◦ Tag, playing on playground, riding a tricycle or bicycle; games requiring catching, throwing, or kicking • Vigorous intensity <ul style="list-style-type: none"> ◦ Running, skipping, dancing, jumping, gymnastics, swimming
	School-aged children	<ul style="list-style-type: none"> • Moderate intensity <ul style="list-style-type: none"> ◦ Brisk walking, riding a bicycle, hiking, swimming, games that require catching and throwing • Vigorous intensity <ul style="list-style-type: none"> ◦ Running, riding a bicycle, jumping rope, cross-country skiing, sports (eg, soccer, basketball, tennis)
	Adolescents	<ul style="list-style-type: none"> • Moderate intensity <ul style="list-style-type: none"> ◦ Brisk walking, riding a bicycle, recreational activities (eg, kayaking, hiking, swimming) • Vigorous intensity <ul style="list-style-type: none"> ◦ Running, riding a bicycle, martial arts, vigorous dancing, sports (eg, soccer, basketball, tennis)

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	Clinical Consideration	Clinical Example/Recommendations
Special Considerations	During the transition to adolescence, physical activity in girls decreases significantly compared with boys (this disparity persists into adulthood)	<ul style="list-style-type: none"> • Female youth may need additional support and encouragement to maintain beneficial levels of physical activity • This may be provided by health professionals, parents, coaches, teachers, peers, and so forth
	Children and adolescents with disabilities are more likely to be inactive than those without disabilities	<ul style="list-style-type: none"> • Youth with disabilities should partner with a health care or physical activity professional to understand appropriate types and amounts of physical activity for them to assist in decreasing inactivity

^a Because the evidence for mental health and wellness benefits in youth are most supported from aerobic activities, these are presented here.

Adapted from US Department of Health and Human Services. Physical activity guidelines for Americans. 2nd edition. Washington, DC: US Department of Health and Human Services; 2018.

Although there is a heritable component to people's microbiota compositions, environmental factors such as diet, stress, and medications are thought to have a larger influence.^{47,50,51} Animal models have shown that an anxious phenotype can be transferred via gut microbiota, and manipulation of the gut microbiota (eg, with probiotics or antibiotics) can influence depression-like behaviors.⁴⁹

Application of knowledge of the gut-brain relationship is a work in progress. Diversity of gut microbiota (rather than the concentration of any particular microorganism species) seems to be an indicator of a healthy gut.⁴⁷ Probiotics are marketed for their possible role in increasing "good bacteria," and therefore potentially benefitting mental health; however, the role of particular microbiota has yet to be fully elucidated, leaving many questions about the particular application of probiotics in the treatment of mental health problems.^{47,48}

Clinical Assessment

Many factors contribute to food choice, including (but not limited to) biological need/appetite, taste preference/sensory stimulation, family/peer/social/cultural influence, habit/routine, cost/access/availability, mood/emotions/craving, health attitudes, and weight awareness. Given the impact on physical and mental health, clinicians are encouraged to evaluate for food insecurity (lack of consistent access to adequate food). The who, what, when, why, and where of eating patterns can offer opportunities to recognize processes that are going well and help bring attention to areas in need of intervention. Given the potential impact of the family system on the eating patterns of children, thorough assessment incorporates nutritional patterns of the family system.⁵² Sample questions and associated recommendations for parents are listed in **Table 7** to assist in this assessment. These questions can be modified to be asked directly of the child as the clinical context allows.

Table 6
Association between dietary pattern and mental/emotional health across the life span

Stage of Life	Mental Health Outcomes
Prenatal and early life	<ul style="list-style-type: none"> ● High adherence to unhealthy diet during pregnancy associated with increased risk of child externalizing problems²⁹⁻³¹ ● Children with high level of unhealthy diet or low level of healthy diet postnatally had higher levels of both internalizing and externalizing problems by 5 y old³²
Childhood and adolescence	<ul style="list-style-type: none"> ● A review of 20 studies across 11 countries found support for an association between unhealthy diet and increased odds of mental health difficulties and between healthy dietary patterns and better mental health³³ Prospective studies: <ul style="list-style-type: none"> ● Jacka and colleagues,³⁴ 2011: a study of nearly 3000 Australian adolescents, predominantly from higher socioeconomic backgrounds <ul style="list-style-type: none"> ○ Better diet quality at baseline predicted better mental health at follow-up even after adjustment for mental health at baseline ○ Improvements in diet quality were associated with improved mental health score at 2-year follow-up, whereas reductions in diet quality were associated with declining psychological functioning ○ Mental health at baseline did not predict diet quality at 2-year follow-up ● McMartin and colleagues,³⁵ 2012: 3757 fifth graders in Nova Scotia participated as part of the Children's Lifestyle and School performance Study (CLASS) survey <ul style="list-style-type: none"> ○ Diet quality was not significantly associated with visits to a health care provider for internalizing disorder ○ Dietary variety may reduce the risk of developing internalizing disorders ○ One-third of children with the highest fish consumption had lower rates of being diagnosed with internalizing disorder ● Jacka and colleagues,³⁶ 2013: evaluated >2000 students from ethnically diverse and socially deprived backgrounds and included a wide range of potentially confounding variables <ul style="list-style-type: none"> ○ Cross-sectional study found an association between unhealthy diet and mental health difficulties ○ Prospective study found that unhealthy and healthy diet scores did not significantly predict mental health status at 3-year follow-up, although patterns of associations were in the same direction as the cross-sectional analysis ● Trapp and colleagues,³⁷ 2016: 746 adolescents participated as part of the Western Australian Pregnancy Cohort (Raine) Study <ul style="list-style-type: none"> ○ Western (unhealthy) dietary pattern at 14 y old was positively associated with greater externalizing behaviors at 17 y old in girls ○ No other statistically significant associations were observed after full adjustment of confounders ● Winpenny and colleagues,³⁸ 2018: 603 adolescents participated as part of the ROOTS study (United Kingdom), participants were from higher socioeconomic status categories, adjustments made for sociodemographic, anthropometric, behavioral, and psychological factors in longitudinal analysis <ul style="list-style-type: none"> ○ There were no prospective associations between healthy diet at 14 y of age and depressive symptoms at 17 y of age after controlling for covariates

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Table 6
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Stage of Life	Mental Health Outcomes
Adulthood	<ul style="list-style-type: none"> • A systematic review and meta-analysis of 13 cross-sectional and cohort studies concluded that healthy diet pattern was significantly associated with reduced odds of depression, but no statistically significant association was observed between unhealthy (Western) diet and depression (trend toward positive association)³⁹ • A meta-analysis of 22 studies investigated the association between a Mediterranean-style diet and brain diseases and determined that higher adherence to the Mediterranean-style diet was associated with reduced risk for depression and cognitive decline⁴⁰ <p>Randomized controlled trial</p> <ul style="list-style-type: none"> • Jacka and colleagues,⁴¹ 2017, Supporting the Modification of lifestyle In Lowered Emotional States (SMILES) trial: included 67 adults diagnosed with depression; 31 in dietary support group and 25 in social support control group for 12 weeks <ul style="list-style-type: none"> ◦ The dietary support group received 7 60-min individual ModiMedDiet counseling sessions: diet rich in vegetables, fruit, and whole grains, with an emphasis on increased consumption of oily fish, extravirgin olive oil, legumes, and raw unsalted nuts, and moderate consumption of red meat and dairy ◦ The dietary support group showed significantly greater improvement in depressive symptoms between baseline and week 12 compared with the control group (32.3% vs 8%), number NNT based on remission score was 4.1 (95% CI of NNT, 2.3–27.8) ◦ All effects were independent of any changes in BMI, self-efficacy, smoking rates, and/or physical activity

Abbreviations: BMI, body mass index; CI, confidence interval; NNT, needed to treat.

Recommendations for Nutrition

The 1990 National Nutrition Monitoring and Related Research Act states that every 5 years the US Department of Agriculture (USDA) and Department of Health and Human Services must jointly publish dietary guidelines based on a preponderance of current scientific and medical knowledge. The 2015 to 2020 Dietary Guidelines for Americans marks the eighth edition and presents several changes from previous versions, including a change from MyPyramid to MyPlate (www.ChooseMyPlate.gov) as the guiding structure for nutritional decision making. The recommendations have increasingly acknowledged the importance of cultural needs as well as financial constraints. With emerging evidence, there are evolving updates for certain recommendations, including those for dietary cholesterol, fats, and calorie restriction:

- Loosening recommendations to limit dietary cholesterol (eg, eggs), but with caution because of frequent correlation between high cholesterol and high saturated fats in food.
- Reframing fats: not all fats are bad (eg, instead of avoiding all fats, move to reducing intake of saturated fatty acids by replacing them with monounsaturated fatty acids; eg, olive oil, nuts, avocados).
- Intermittent fasting and calorie restriction might have potential benefits in some adults; however, this is not recommended in children and adolescents given energy and growth requirements at this stage.

Table 7

Components of a nutritional assessment in the context of a mental health evaluation

Category	Sample Questions	Recommendations
What are they eating?	<p>Are they:</p> <ul style="list-style-type: none"> • Eating a variety of nutrient-dense foods? • Limiting processed foods that are high in added sugars, sodium, and saturated fat (eg, potato chips, fast food pizzas, white bread)? • Choosing water rather than juice and soda? • Showing any restrictions, aversions, or patterns of picky eating? • Taking vitamins and/or supplements? 	<ul style="list-style-type: none"> • Shift focus from what not to eat to what to eat (eg, gradually replace candy/sweets with fruit, refined grain [eg, white bread] with whole grain, butter with olive oil, potato chips with kale chips or sweet potato fries) • Limit/avoid artificial sweeteners^{53,54} (eg, choose water rather than diet soda) • If a child shows a pattern of picky eating, consider offering a choice between healthy food options (that the child might have helped pick in the store) in small, manageable portions in the context of an enjoyable environment in which all family members are eating the same meal (www.choosemyplate.gov) • Aim to obtain nutrients from food rather than supplements when possible (eg, drinking smoothies that include combinations of fruit, vegetables, and nuts, plus additional options of spices, oils, and seeds) • Include prebiotic (eg, bananas, garlic, onion) and probiotic foods (eg, fermented foods, yogurt) in the diet
Why are they eating?	<p>Is the purpose of eating:</p> <ul style="list-style-type: none"> • For nourishment/energy? • For enjoyment, craving? • To manage emotion, stress, boredom, or to provide comfort? 	<ul style="list-style-type: none"> • Consider the role of mindful eating: making deliberate food choices and fully paying attention to the food⁵⁵ • Develop a list of healthy alternatives for comfort eating. In a study of college students there was no significant difference in resolution of negative feelings between groups that ate (1) comfort food, (2) liked-but-not-comforting food, or (3) plain granola bars⁵⁶
With whom are they eating?	<ul style="list-style-type: none"> • What is the frequency and quality of family meals? • What is being modeled (eg, in the household)? 	<ul style="list-style-type: none"> • Aim for at least 5 family meals per week (does not necessarily have to be dinner)⁵⁷ • Aim to make meals enjoyable experiences, choosing topics of conversation that foster engagement and interest • Encourage parents to increase awareness of their eating pattern and the impact it has not only on themselves but also on their children

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Category	Sample Questions	Recommendations
When do they eat?	<ul style="list-style-type: none"> • How often are they eating breakfast? • How about snacks? • What is the daily eating schedule? 	<ul style="list-style-type: none"> • Problem-solve limitations to eating breakfast, because associations exist between having breakfast and improved student psychosocial and academic functioning⁵⁸ • Deliberately plan snack content and timing to manage energy needs of the child • Develop a list of acceptable healthy snacks and keep them readily available: Create a kids' snack drawer/ cabinet that offers easily accessible healthy snacks; have fruits and vegetables precut and available for munching in a bowl on the counter/kitchen table
Where do they eat?	<ul style="list-style-type: none"> • Are they eating at the kitchen/ dining room table? • How often are they eating in front of TV/screens? • How often are they eating at fast food restaurants? 	<ul style="list-style-type: none"> • Maximize eating in spaces that promote mindful eating (eg, eat snacks at the kitchen table instead of in front of TV/computer/phone)

Although specific recommendations are likely to continue to change as knowledge and understanding of the interaction between food and the mind/body increase, a theme in current recommendations is to focus on a healthy eating pattern that is:

- High in fruits and vegetables (variety), whole grains, seafood, nuts, and legumes
- Moderate in low-fat dairy products
- Low in red and processed meat
- Very limited in processed foods, saturated fats and trans fats, added sugars, and sodium (unhealthy diet pattern)

As with changes in physical activity, improvement in dietary pattern can be challenging to accomplish quickly. Engaging the patient and family in motivational interviewing to help assess readiness to change (and first focusing on improving motivation to change if needed), identifying goals that are both appealing and manageable, and breaking goals down into small, incremental steps can increase the likelihood of success.⁵⁹ Opportunities for improved nutritional patterns through the who, what, when, why, and where of eating should be considered as part of psychiatric assessment and treatment planning and are included in [Table 7](#).

SLEEP SCIENCE

Clinical Relevance and Current Research

Along with diet and exercise, sleep is an essential activity that plays a crucial role in emotional and physical development, health, and well-being. Quality sleep is associated with positive health and emotional outcomes in youth, including, but not limited to, improvements in attention, learning, academic performance, memory,

cognition, behavior, and emotion regulation, as well as enhanced self-esteem, self-acceptance, levels of optimism, and overall quality of life.^{60–62} In contrast, a wealth of evidence attests to the relationship between inadequate sleep and poorer health and emotional well-being in youth, including greater levels of self-criticism, internalizing symptoms, risk-taking behaviors, risk for suicidality and psychiatric illness, in addition to a host of negative effects on physical health and cognitive capabilities.^{60,61,63–65}

Adequate sleep has been defined as the number of hours of daily sleep that an individual requires to function optimally and feel well rested.⁶⁶ Regrettably, most youth are not obtaining adequate sleep. Moreover, the likelihood that children will obtain adequate sleep decreases with age.⁶⁴ A survey of US students showed that nearly 60% of middle school students and nearly 75% of high school students endorsed short sleep duration on school nights (defined as <9 hours for children aged 6–12 years, or <8 hours for adolescents aged 13–18 years).⁶⁷ Similar results were found in a more recent study of high school students, with 71.9% reporting less than 8 hours of sleep per night.⁶⁵ In addition, this study found that the odds of engaging in risky behaviors (eg, risky driving, substance use, aggressive behaviors) increased as hours of sleep decreased.⁶⁵ Crucially, the strongest association was identified between sleep and mood and/or self-harm; youth who slept less than 6 hours per night were 3 times more likely to report suicidal behavior.⁶⁵

Several factors contribute to poor sleep in youth, including electronic media exposure; caffeine consumption; early school start times; chronic medical conditions; neurologically based sleep disorders (eg, obstructive sleep apnea, restless legs syndrome); and pressures to achieve good grades, participate in extracurricular activities, and maintain an active social life.⁶⁴ Notably, youth from families of a lower socioeconomic status, as well as racial and ethnic minority youth, are at higher risk for insufficient sleep.^{68,69} Sleep disruptions are frequently identified in children with psychiatric disorders, including attention-deficit/hyperactivity disorder, mood and disorders, and autism spectrum disorders.⁶³ The relationship between sleep and psychiatric illness is often bidirectional, whereby sleep disruptions are a symptom of a psychological disorder and the resulting poor sleep compounds and intensifies the condition.^{63,70}

How It Works

Sleep architecture throughout most of childhood, adolescence, and adulthood consists of 2 stages: non-rapid eye movement sleep (NREM) and rapid eye movement sleep (REM), which are characterized by distinct electroencephalographic patterns and physiologic features. NREM sleep progresses through 3 stages of increasingly deep sleep and is considered necessary for rest and restoration. REM sleep follows stage 3 of NREM sleep, and is characterized by bouts of rapid eye movements, the suppression of muscle tone, and increases in brain activity, during which dreaming occurs. REM sleep is associated with dreaming, and is thought to play a role in the consolidation of memory and is crucial for the healthy development of the central nervous system. Children and adults enter sleep at stage 1 of NREM sleep and progress through NREM and REM cycles, which lengthen across development from 45 to 60 minutes in infancy to 90 to 110 minutes in childhood and adulthood, with brief periods of waking in between cycles. The amount of sleep necessary per 24-hour period peaks in neonates and decreases across childhood and adolescence.⁷¹

Table 8 outlines consensus guidelines from the American Academy of Sleep Medicine detailing the recommended amount of sleep in childhood and adolescence by age group.

Age Group	Recommended Amount of Sleep per 24-h Period (h)
Infants 4–12 mo	12–16 (including naps)
Children 1–2 y	11–14 (including naps)
Children 3–5 y	10–13 (including naps)
Children 6–12 y	9–12
Teenagers 13–18 y	8–10

Adapted from Paruthi S, Brooks LJ, D’Ambrosio C, et al. Recommended amount of sleep for pediatric populations: a consensus statement of the American Academy of Sleep Medicine. *J Clin Sleep Med* 2016;12(6):785–6.

Clinical Assessment

Despite recommendations that sleep assessment be part of child well-visits, sleep is not regularly addressed in pediatric primary care.⁷² It is therefore essential that mental health providers recognize the links between sleep and emotional well-being, and continuously assess and address sleep issues in the course of their work with youth. This assessment includes recognizing that both too little and too much sleep are associated with poorer outcomes.⁶¹ Tools to assess pediatric sleep include clinical interviews, sleep diaries, and sleep questionnaires, such as the parent-report Children’s Sleep Habits Questionnaire⁷³ or the adolescent-report School Sleep Habits Survey.⁷⁴ Clinicians should also assess environmental factors related to sleep quality and can be influential in assisting families to implement evidence-based behavioral recommendations to improve sleep. **Table 9** highlights potential areas of inquiry for parents or guardians to facilitate assessment of sleep hygiene and environmental factors. These questions can be modified to be asked directly of children as clinical context allows.

Recommendations for Sleep

Guidelines from the American Academy of Pediatrics detailed earlier can inform age-based recommendations for sleep duration, recognizing that the sleep needs of individual children may vary depending on the unique genetic, behavioral, medical, emotional, and environmental factors at play. In addition to recommendations about the duration of sleep, there are several environmental factors that should be considered, outlined in **Table 9**. In short, parents of children and adolescents should establish regular bedtimes and wake times to facilitate age-based recommendations for sleep duration. Implementing a consistent, predictable, and calming bedtime routine is particularly beneficial for children aged 12 years and younger.^{60,75} Most research supports recommendations that sleep should occur:

- Independent of parental presence
- In a cool (16°–19°C [60°–67° F]), dark, comfortable, quiet room reserved primarily for sleeping⁶⁰
- With minimal exposure to electronics, particularly in the evenings, and all electronic devices should be removed from children’s rooms

In addition, sleep is optimized when children maintain a healthy diet, participate in regular physical activity, and have their emotional needs met during the day.⁶⁰ Some children require more targeted interventions to improve their sleep. Emerging evidence suggests that cognitive behavioral and mindfulness-based treatments may

Table 9

Sample questions to assess sleep hygiene in the context of a mental health evaluation and related recommendations

	Example Questions	Recommendations
Sleep Duration	<ul style="list-style-type: none"> • How long does the child sleep each night? • When is the child's bedtime during the week? On weekends? • How long does it take for the child to fall asleep at night? • Is the child napping? If yes, how frequently and for how long? • What is the child usually doing while waiting to fall asleep? (eg, listening to music, thinking about tomorrow, thinking about past events) • Is the child experiencing nighttime awakenings? If yes, how frequently and for how long? 	<ul style="list-style-type: none"> • Adjust bedtimes and wake times to allow for age-appropriate sleep duration (see guidelines discussed earlier) • If it typically takes time for the child to fall asleep, set an earlier bedtime to permit the recommended amount of sleep (eg, a 13-y-old who wakes at 6 AM for school and takes 30 min to fall asleep should go to bed by 9:30 PM at the latest to ensure 8 h of nighttime sleep) • Keep bedtimes and wake times as consistent as possible on weeknights and weekends • Avoid daytime naps for children 6 y of age and older, unless the child is ill. Daytime naps for older children make it less likely that they will sleep at night • Encourage diaphragmatic breathing (belly breathing), progressive muscle relaxation, or other breathing-based relaxation strategies to facilitate sleep onset • For nighttime awakenings that last longer than 15 min, get out of bed and do a quiet activity (eg, reading, coloring) in dim light for 10 min, and then return to bed. This technique helps to reinforce that bed is associated only with sleep
Routines	<ul style="list-style-type: none"> • What is the child's daytime routine? (ie, meal times, school attendance, participation in extracurricular activities) • How consistent are the child's daytime and nighttime schedules? • Does the child have a wind-down or nighttime routine? (ie, shower, brush teeth, read a book, lights out) • Is the child's bed used for activities other than sleep, such as homework, watching TV, using the phone? 	<ul style="list-style-type: none"> • Predictability during the day can help optimize nighttime sleep • Engaging in a consistent and calming bedtime routine can improve sleep; initiating the routine eventually cues the body that it is time for sleep via classic conditioning • Restrict caffeine intake beginning in the afternoon • Avoid exercising 3 h before bedtime • Avoid eating <2 h before bed, and limit liquid intake • Take a warm shower or bath before bed to relax. The change in body temperature from the warm water to the cool air also facilitates cooling of the body, which improves sleep • Listen to slow, relaxing music for 45 min before bedtime • The bed should be reserved only for sleep; avoid doing other activities on or in bed to reinforce the association between the bed and sleep

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	Example Questions	Recommendations
Sleep Environment	<ul style="list-style-type: none"> • Where does the child sleep in the home? • Does the child sleep alone? With siblings? With parents? • What is the child's sleep environment like? (eg, bright, noisy, comfortable, free of electronics) 	<ul style="list-style-type: none"> • Whenever possible, sleep should occur independently (ie, in the child's own room) and in a dark room • Consider using white noise machines or fans to block sounds that may cause wakefulness • Sleep is optimized when the bedroom temperature is 16°–19°C [60°–67°F] (ie, the room should feel mildly chilly when you get out of bed) • Reduce exposure to blue light (ie, LED, florescent lights, screens) before bed; shift electronics to nighttime settings in the evening if they must be used before bed • Whenever possible, avoid exposure to screens entirely for 1–2 h before bedtime. Keep electronics away from the bed or bedside to avoid interruptions from notifications • Prevent viewing the clock by turning the clock face away or removing it entirely, because clockwatching can increase anxiety about not getting enough sleep

Abbreviation: LED, light-emitting diode.

be effective in addressing problems associated with poor sleep in at-risk youth.⁷⁶ When sleep problems do not respond to standard behavioral interventions, children should be referred for appropriate treatment.

Physical Activity, Nutrition, and Sleep Within a PERMA Framework

Because regular physical activity, balanced nutrition, and quality sleep are associated with improved well-being across the lifespan, it may be helpful for clinicians to adopt a framework that highlights the role of each lifestyle factor in optimizing well-being; one such framework is the PERMA model of mental well-being created by Martin Seligman, PhD.¹⁵ This approach proposes that mental well-being is a multifactorial construct that includes the following elements¹⁵:

- P: positive emotions
- E: engagement
- R: relationships
- M: meaning
- A: accomplishments

The model further proposes a positive association between each of these elements and overall well-being. Clinicians may find it useful to consider PERMA elements during assessment and treatment to encourage children and adolescents to meet recommendations for physical activity, balanced nutrition, and sleep. **Table 10** offers example questions to address these PERMA factors in relation to each lifestyle factor. These questions can be modified to be asked of the parent as needed.

Table 10
Sample questions applying the PERMA wellness model to assess physical activity, nutrition, and sleep in the context of a mental health evaluation

PERMA Factor ¹⁵	Sample Questions		
	Physical Activity	Nutrition	Sleep
Positive emotion	<ul style="list-style-type: none"> • What types of physical activity make you feel excited? Happy? Energized? • What positive emotions do you feel when you have finished working out? • How does exercising with other people, or playing a team sport, make you feel? 	<ul style="list-style-type: none"> • Which meals make you feel content? Happy? Energized? Connected to others? • What are some of your favorite foods? • What positive emotions do you feel when you enjoy a nutritious meal? Is this any different from when you make less healthy choices? 	<ul style="list-style-type: none"> • What is something you do before you go to bed that helps you to feel calm? • What positive emotions do you feel when you lie down in your bed to sleep at night? • How you feel when you wake up after a good night's sleep?
Engagement	<ul style="list-style-type: none"> • Which physical activities or sports best capture your interest? • What do you like about participating in team sports? How about individual sports? • Does competition help you push yourself, or impair your performance? 	<ul style="list-style-type: none"> • Do you prepare meals yourself or with others? What are some of the benefits of both? • Where do you like to eat? Do you enjoy going to restaurants, or do you prefer eating meals at home? • What do you like to do while you are cooking? Do you listen to music, turn on the TV, talk to others? Or do you practice mindfulness while cooking? 	<ul style="list-style-type: none"> • Do you look forward to sleeping? When you lie down, do you enjoy how your pillow and covers feel? Do you let go of your thoughts about the day to enjoy being in your bed? • What is a relaxing activity that you do before bed? Do you like to read a book, listen to calming music, or take a hot bath? • Is your bed the most comfortable place for you to sleep? Do you have several places where you feel so comfortable that it is easy for you to fall and stay asleep? • What is it like for you to do breathing exercises as you try and fall asleep?
Relationships	<ul style="list-style-type: none"> • Is there anyone with whom you like to exercise? • What team sports do you like to play? What is it like for you to be part of a sports team? • How does exercising with other people make you feel? Do you find that you push yourself more when you exercise with a partner? 	<ul style="list-style-type: none"> • Who do you eat your meals with? Who do you enjoy eating with the most? • What sorts of things do you talk about when you eat meals with others? • How do you use meals to help build or support your relationships? Do you go out to dinner with friends, catch up with classmates over lunch in the cafeteria, or make meals with your family? 	<ul style="list-style-type: none"> • How do you say goodnight to your family members before bed? • Do you feel safe and protected while you sleep? • Are there any books or songs that you share with others before bed?

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Table 10
(continued)

PERMA Factor ¹⁵	Sample Questions		
	Physical Activity	Nutrition	Sleep
Meaning	<ul style="list-style-type: none"> • What do you value about being physically active? Why is it important to you? • How do you feel about yourself when you are physically active on a regular basis? • What does winning or losing at a competitive physical activity mean to you? How does winning or losing affect you? 	<ul style="list-style-type: none"> • Why does eating healthily matter to you? • Are there special meals that you and your family make during holidays or other special occasions? • What foods have meaning to you? Do any foods remind you of happy times, holidays, or special people? 	<ul style="list-style-type: none"> • What is something that you have in your sleep environment/bedroom that is significant to you? A favorite stuffed animal? A picture of loved ones by your bed? • Do you value your sleep? Does it make you feel better? • Do you value and think or talk about your dreams?
Accomplishments	<ul style="list-style-type: none"> • Tell me about something that you accomplished that was physically challenging. How did you surprise yourself? • What is it like for you when you are part of a team that wins or performs well? • How do you think your schoolwork is affected by getting exercise? How about your social life? 	<ul style="list-style-type: none"> • Do you feel a sense of pride when you make healthy food choices instead of unhealthy ones? • What is it like for you to prepare and eat a well-balanced meal? 	<ul style="list-style-type: none"> • Do you notice any relationship between your sleep and your school performance (eg, paying attention in class)? • How does sleep affect how effective you are at getting things done the next day?

SUMMARY

The benefits conferred by physical activity, balanced nutrition, and quality sleep to youth physical well-being have generally been accepted. Emerging evidence continues to shed light on their benefits for youth mental health and wellness as well, including psychiatric disorders. These benefits seem to occur through multifactorial effects on neurobiological and psychosocial development. Integrating ongoing assessments and interventions related to these lifestyle domains within clinical practice promotes positive mental as well as physical health in youth, including enhancing treatment of psychiatric disorders and their impacts on functioning.

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