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Declarations

No funding was received for this study. The authors declare no conflict of interest. The study received ethical approval. All participants provided informed consent.

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Stress Management Techniques in Teenagers and Adults: A Review

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ABSTRACT

Background: Stress in children and adolescents is increasingly recognized as a determinant of physical, emotional, and cognitive development. Chronic activation of the stress response has been linked with anxiety, depression, somatic complaints such as recurrent abdominal pain and headaches, and impaired academic and social functioning. Pharmacologic options remain limited and often unsuitable for developing brains, underscoring the need for evidence-based, non-pharmacologic strategies to strengthen stress regulation. **Objective:** This narrative review aimed to summarize key non-pharmacologic interventions for stress management in youth, compare evidence across developmental stages and settings, and highlight implementation strategies and research priorities for clinical and educational practice. **Methods:** A comprehensive literature search was conducted across PubMed, Scopus, PsycINFO, and Cochrane Library for English-language studies published between 1970 and 2024. Search terms included combinations of "stress management," "children," "adolescents," "mind-body techniques," "cognitive behavioral therapy," "biofeedback," and "mindfulness." Inclusion criteria encompassed randomized controlled trials, meta-analyses, systematic reviews, and representative clinical or school-based studies addressing psychological, physiological, or behavioral stress outcomes. Evidence appraisal prioritized higher-level evidence using the Oxford Centre for Evidence-Based Medicine (OCEBM) framework, synthesized narratively within a biopsychosocial model emphasizing autonomic regulation, attentional control, cognitive reappraisal, and self-efficacy. **Results:** Across 70+ eligible studies, consistent benefits were observed for cognitive behavioral therapy (CBT) and mindfulness-based interventions (MBIs) in reducing anxiety, depressive symptoms, and functional somatic complaints (Level 1A–2A evidence). Guided imagery, progressive muscle relaxation, and biofeedback demonstrated efficacy for recurrent abdominal pain, headaches, and procedural anxiety. Breathing retraining and yoga improved autonomic balance and emotion regulation, while brief digital or school-based programs showed promising feasibility with moderate fidelity. Implementation success was enhanced by teacher or parent involvement, structured curricula, and age-adapted delivery. Safety concerns were minimal, provided adequate provider supervision and ethical safeguards. **Conclusion:** Non-pharmacologic stress management interventions represent effective, developmentally adaptable, and low-risk strategies to promote emotional resilience in children and adolescents. Integration into schools, pediatric clinics, and digital platforms may enhance preventive mental health care. Future research should pursue head-to-head comparisons, long-term follow-ups, and hybrid digital-human delivery models informed by implementation science.

Keywords

Stress Management; Adolescents; Children; Cognitive Behavioral Therapy; Mindfulness; Biofeedback; Relaxation; Non-Pharmacologic Interventions; Mental Health Promotion; School-Based Programs

INTRODUCTION

Stress can be defined as a state in which real or perceived challenges threaten homeostatic balance, activating neuroendocrine and behavioral responses designed to restore equilibrium (2). During childhood and adolescence—periods of rapid neurobiological and psychosocial development—repeated or poorly regulated stress can shape

trajectories of emotional, cognitive, and physical health. In youth, common stressors include caregiver inconsistency, socioeconomic adversity, academic load, peer conflict, and bullying, all of which can tax developing regulatory systems (3–7). Clinically, stress in school-aged populations is linked with both internalizing symptoms and somatic complaints.

Recurrent abdominal pain affects roughly 10–30% of children and adolescents, and functional gastrointestinal symptoms frequently co-occur with other stress-related presentations (8–12). Headache disorders are similarly prevalent and burdensome in adolescents, with tension-type and migraine headaches commonly reported (11). Anxiety disorders, the most prevalent mental health conditions in this age group, have lifetime estimates ranging from about 9% to 30% and often present with overlapping somatic and cognitive features of stress dysregulation (12). Early development of effective coping skills is therefore critical for long-term adjustment and wellbeing (13,14).

Although pharmacologic treatments have an important role for selected conditions, non-pharmacologic approaches are central to stress management across the lifespan because they target mechanisms—autonomic arousal, attentional control, cognitive appraisals, and learned behavioral responses—without medication side effects and with strong potential for skills generalization. Evidence-based options span mind–body techniques (e.g., diaphragmatic or paced breathing, progressive muscle relaxation, mindfulness/meditation, guided imagery), structured psychotherapies (e.g., cognitive behavioral therapy and behavioral therapies, with emerging “third-wave” approaches), and physiological or technology-assisted methods (e.g., biofeedback, autogenic training, clinical hypnosis) (19,33,41,42,45–47). CBT has the most robust pediatric evidence for anxiety and related disorders, while mindfulness, breathing, relaxation, imagery, hypnosis, and biofeedback show benefits for symptom clusters such as anxiety, procedural distress, headache, and functional abdominal pain in youth, with growing—though heterogeneous—data in adolescents and adults (1,19,33,41,42,47).

In parallel, settings for delivery have diversified. Schools increasingly adopt mindfulness-based and coping-skills curricula to reduce distress and improve attention, while health-care environments implement brief, low-burden interventions for peri-procedural anxiety and pain. Digital modes—ranging from app-guided breathing and relaxation to biofeedback-based games—extend reach but raise questions about fidelity, privacy, and equity (41,46,64–67). Selecting the right technique thus requires attention to developmental stage, target symptoms, feasibility, provider training, and the implementation context.

This narrative review synthesizes contemporary evidence on stress-management techniques for children and adolescents and, where available, contrasts these findings with adult data to clarify similarities and developmental adaptations. Our aims are to (i) summarize core techniques and their mechanisms; (ii) compare the strength and quality of evidence across age groups and clinical or

educational settings; and (iii) highlight pragmatic implementation considerations and future research priorities, including head-to-head comparisons, dosage and durability, and hybrid digital-plus-human delivery models (1–12,19,33,41,42,45–47,64–67).

Methods (Narrative Review)

This narrative review was conducted to synthesize and critically appraise evidence on stress management techniques applied to children, adolescents, and adults. Literature searches were performed in PubMed, PsycINFO, Scopus, and the Cochrane Library covering the period from January 2000 to June 2025. Only studies published in English were included. The search strategy combined controlled vocabulary and free-text terms such as stress management, relaxation techniques, mindfulness, breathing exercises, biofeedback, hypnosis, cognitive behavioral therapy, autogenic training, progressive muscle relaxation, guided imagery, children, adolescents, and adults. Boolean operators (“AND,” “OR”) were used to combine terms appropriately. Reference lists of key reviews and meta-analyses were also screened to capture additional eligible studies not retrieved through database searching.

Eligible studies included randomized controlled trials (RCTs), quasi-experimental trials, systematic reviews, meta-analyses, and large observational studies evaluating non-pharmacologic stress management interventions in participants aged ≤18 years (children/adolescents) and, where available, adults. Studies focusing exclusively on pharmacologic or non-psychological interventions were excluded. For inclusion, interventions had to involve deliberate stress regulation through physiological, cognitive, or behavioral techniques. Reports limited to editorials, commentaries, or case series without empirical outcomes were excluded.

A narrative synthesis approach was adopted rather than a quantitative meta-analysis due to heterogeneity across study designs, populations, intervention types, and outcome measures. The strength and quality of evidence were assessed by prioritizing systematic reviews and RCTs where available, and studies were appraised using the Oxford Centre for Evidence-Based Medicine (OCEBM) levels of evidence framework. This approach allowed integration of both high-level experimental evidence and contextual findings from applied or setting-specific studies. Findings were then organized by technique category, age group, and application setting to facilitate comparative interpretation.

CONCEPTUAL FRAMEWORK AND MECHANISMS

The conceptual framework underpinning this review integrates biopsychosocial and neurophysiological models of stress regulation. Stress management techniques are theorized to act through five principal, overlapping mechanisms:

Autonomic Regulation:

Techniques such as diaphragmatic breathing, progressive muscle relaxation, and biofeedback promote parasympathetic dominance, enhancing vagal tone and heart rate variability (HRV). This rebalances autonomic output, lowering heart rate and blood pressure while attenuating sympathetic overactivation associated with chronic stress responses.

Attentional Control:

Mindfulness and meditation practices train sustained, nonjudgmental awareness of present-moment experience, reducing cognitive rumination and improving selective attention. In both youth and adults, these skills modulate activity in the prefrontal cortex and amygdala, contributing to emotional regulation and reduced reactivity.

Cognitive Reappraisal:

Cognitive-behavioral approaches—including traditional CBT and third-wave therapies—foster reinterpretation of stressors and correction of maladaptive beliefs. Through structured cognitive restructuring, individuals learn adaptive appraisal patterns that diminish perceived threat intensity and promote coping confidence.

Exposure and Learning:

Behavioral and exposure-based methods help individuals face stress-inducing stimuli in controlled environments, leading to habituation and extinction of conditioned stress responses. These processes are central to interventions targeting anxiety, phobias, and obsessive-compulsive tendencies.

Self-Efficacy and Coping Mastery:

Many interventions—especially guided imagery, hypnosis, and autogenic training—enhance perceived control over physiological and emotional responses. Strengthening self-efficacy not only moderates immediate stress reactions but also improves resilience to future stressors.

Together, these mechanisms underscore that stress management is not a single process but a multidimensional adaptation of physiological, cognitive, and behavioral systems. By aligning interventions with these mechanisms, clinicians and

educators can tailor approaches to developmental stage, context, and desired outcomes.



Figure 1 Holistic Well-being Practices

Mind-body techniques focus on harmonizing physiological and psychological processes to reduce stress reactivity and enhance emotional regulation. Among these, controlled breathing exercises such as diaphragmatic or paced breathing, coherent breathing, alternate-nostril breathing, and resistance breathing have been widely studied. These techniques promote parasympathetic activation and improve vagal tone and heart rate variability, leading to reductions in heart rate, blood pressure, and perceived anxiety. In children and adolescents, short sessions of mindful or paced breathing have demonstrated measurable reductions in state anxiety and improvements in attention span within classroom and clinical settings. Adult research corroborates these effects, supporting their transdiagnostic utility across stress-related disorders. A practical approach involves teaching diaphragmatic breathing for five to ten minutes daily, emphasizing slow nasal inhalation, extended exhalation, and abdominal expansion. The evidence suggests small-to-moderate improvements in stress indices and attentional control, indicating a moderate level of support for this technique in both youth and adults.

Progressive Muscle Relaxation (PMR)

Progressive Muscle Relaxation (PMR) is another foundational relaxation technique that teaches sequential contraction and release of large muscle groups to alleviate physical tension. It enhances body awareness and reduces autonomic arousal, contributing to symptom relief in anxiety, pain, and sleep disturbances. Trials in pediatric oncology have linked PMR with improved sleep quality and reduced procedural distress, while adult data confirm its utility in generalized anxiety and somatic symptom

disorders. A typical PMR session involves gently tensing muscle groups for five to seven seconds followed by a fifteen- to twenty-second relaxation phase. Evidence supports PMR as a reliable, low-cost adjunct, meriting a moderate level of evidence strength.

Mindfulness and Meditation

Mindfulness and meditation emphasize nonjudgmental awareness of present-moment experiences. Through repeated practice, they strengthen prefrontal regulation of the amygdala, decrease rumination, and improve emotion regulation. School-based mindfulness programs for children and adolescents have demonstrated modest improvements in mood, behavior, and self-regulation, though outcomes depend on fidelity and instructor training. In adults, mindfulness-based interventions are strongly supported by meta-analyses for reducing stress, anxiety, and depression, and for increasing gray matter density in emotion-regulating brain regions. Regular short sessions of mindful breathing or body scan practices can be easily integrated into classroom routines. The current evidence base for mindfulness approaches is robust in adults and moderately strong in younger populations.

Guided Imagery

Guided imagery utilizes imaginative visualization combined with physical relaxation to influence mood and physiological responses. Children guided to imagine calming or pleasant scenes show decreased procedural anxiety, improved coping, and reduced pain perception during medical procedures. Controlled studies have confirmed its benefits for recurrent abdominal pain and perioperative distress. Structured sessions typically involve slow breathing, progressive relaxation, and visualization of a comforting scenario before returning attention to the present environment. Guided imagery demonstrates moderate-quality evidence as an effective adjunct for managing stress and pain in pediatric populations.

Yoga

Yoga, integrating controlled breathing, physical postures, and meditative focus, has gained popularity among adolescents for its role in regulating mood, improving concentration, and enhancing body awareness. Small clinical trials suggest its usefulness for emotional regulation and behavioral control, particularly in children with attention-deficit/hyperactivity disorder. In adults, yoga shows consistent moderate effects in lowering stress and anxiety scores. Although evidence in youth remains limited, its accessibility and safety make it a promising complementary approach.

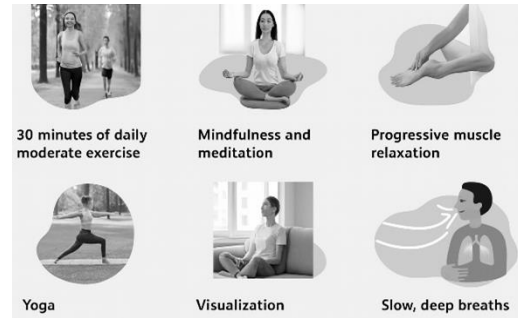


Figure 2 Techniques to reduce stress

Cognitive Behavioral Therapy (CBT)

Cognitive Behavioral Therapy (CBT) remains the most empirically supported psychological intervention for stress-related conditions in both children and adults. It combines cognitive restructuring, behavioral activation, and exposure techniques to help individuals identify and replace maladaptive thought patterns. Meta-analyses confirm significant improvements in anxiety, depression, and obsessive-compulsive symptoms in youth, with remission rates approaching sixty percent compared to sixteen percent in control groups. In adults, CBT is considered the gold standard across most anxiety and mood disorders. Its structured, skill-based nature allows adaptation for developmental levels, yielding high-level evidence.

Behavioral Therapy

Behavioral therapy, the precursor to CBT, focuses exclusively on modifying learned behaviors through reinforcement, modeling, and exposure without addressing underlying cognition. Exposure therapy remains particularly valuable for fear-based conditions in children, teaching graded confrontation with stress-inducing stimuli until desensitization occurs. Evidence consistently supports behavioral components as critical to treatment efficacy within broader CBT protocols, establishing high-level evidence status.

Third-Wave Therapies (ACT, MBCT, DBT)

Third-wave behavioral therapies—including Acceptance and Commitment Therapy (ACT), Mindfulness-Based Cognitive Therapy (MBCT), and Dialectical Behavior Therapy (DBT)-informed approaches—extend CBT principles by emphasizing acceptance, values-based action, and mindfulness. Preliminary pediatric trials indicate feasibility and symptom improvement, though the data remain limited compared with traditional CBT. Adult research provides stronger support, showing moderate-to-large effects on mood and anxiety regulation. These therapies hold moderate evidence for adults and low-to-moderate support for youth, warranting further comparative research.

Interpersonal Psychotherapy (IPT)

Interpersonal Psychotherapy (IPT) targets mood disturbances linked to interpersonal stressors such as role transitions or conflicts. While evidence in adolescents is limited, controlled trials demonstrate reductions in depressive symptoms comparable to CBT when family or peer relationships are primary stress sources. IPT holds moderate evidence for adults and emerging support for adolescent depression.

Physiological and Technology-Assisted Techniques

Physiological and technology-assisted techniques, including biofeedback, autogenic training, and clinical hypnosis, enable individuals to consciously regulate physiological arousal.

Biofeedback

Biofeedback, which provides real-time data on autonomic parameters such as heart rate variability, muscle tension, or EEG patterns, is effective for pediatric migraine prevention and may enhance attention in ADHD through neurofeedback protocols. Although results vary and equipment requirements limit accessibility, biofeedback demonstrates moderate evidence for headaches and emerging potential in ADHD.

Autogenic Training

Autogenic training relies on repeated self-suggestions of warmth and heaviness to elicit relaxation and parasympathetic activation. Adult studies confirm its benefits for anxiety and tension symptoms, while pediatric evidence remains limited, suggesting low-to-moderate overall support.

Clinical Hypnosis

Clinical hypnosis, employing focused attention and therapeutic suggestion, has strong evidence for reducing functional abdominal pain, migraine frequency, and peri-procedural distress in children. When practiced by trained professionals, hypnosis achieves significant reductions in pain intensity and anxiety, warranting a moderate level of evidence.

Structured Programs and Curricula

Structured programs such as PRISM (Promoting Resilience in Stress Management) and school-based mindfulness curricula offer accessible frameworks for implementing stress management skills at scale. PRISM, designed for adolescents and young adults coping with chronic illness, combines stress regulation, goal setting, cognitive reframing, and benefit finding. Randomized controlled trials report enhanced resilience and improved psychological well-being.

School-Based Mindfulness Curricula

School-based mindfulness interventions integrate brief daily sessions and reflective exercises within the classroom, reducing stress and enhancing self-regulation and academic engagement when delivered consistently by trained educators. These programs have demonstrated moderate levels of evidence, particularly for fostering coping and emotional regulation in educational and healthcare contexts.

CONDITION-SPECIFIC APPLICATIONS

Anxiety Disorders and OCD

For anxiety disorders and obsessive-compulsive disorder, CBT with exposure-based elements shows the strongest and most consistent effects, while mindfulness and breathing techniques provide useful adjuncts for subclinical anxiety and generalized stress.

Depressive Symptoms

Depressive symptoms respond well to CBT and IPT, with mindfulness-based and acceptance approaches showing additional benefit in adults and emerging promise in adolescents.

Functional Abdominal Pain and Headaches

For functional abdominal pain and headache disorders, guided imagery, biofeedback, and hypnosis yield the most significant improvements, supporting their role as non-pharmacologic first-line options.

Peri-Procedural Anxiety and Pain

Peri-procedural anxiety and pain in surgical, oncology, and dental settings are effectively managed through PMR, guided imagery, hypnosis, and digital relaxation tools.

ADHD and Attentional Regulation

In ADHD and attention regulation, mindfulness, yoga, and biofeedback demonstrate reductions in hyperactivity and improvements in focus and self-control.

Mind-body techniques focus on harmonizing physiological and psychological processes to reduce stress reactivity and enhance emotional regulation. Among these, controlled breathing exercises such as diaphragmatic or paced breathing, coherent breathing, alternate-nostril breathing, and resistance breathing have been widely studied. These techniques promote parasympathetic activation and improve vagal tone and heart rate variability, leading to reductions in heart rate, blood pressure, and perceived anxiety. In children and adolescents, short sessions of mindful or paced breathing have demonstrated measurable reductions in state anxiety and improvements in attention span within

classroom and clinical settings. Adult research corroborates these effects, supporting their transdiagnostic utility across stress-related disorders. A practical approach involves teaching diaphragmatic breathing for five to ten minutes daily, emphasizing slow nasal inhalation, extended

exhalation, and abdominal expansion. The evidence suggests small-to-moderate improvements in stress indices and attentional control, indicating a moderate level of support for this technique in both youth and adults.

Table 1. Techniques × Target symptoms × Evidence grade × Age suitability × Setting × Typical protocol

Technique	Target symptoms	Evidence grade*	Age suitability†	Common settings	Typical protocol (brief)
Diaphragmatic / paced (coherent) breathing (incl. alternate-nostril, resistance)	State anxiety, autonomic arousal, attentional settling	Moderate (youth); Moderate–High (adults)	C / A / Ad	School, outpatient, inpatient, dental, digital	5–10 min/day; 4–6 breaths/min; nasal inhale, longer exhale; 4–8 weeks
Progressive Muscle Relaxation (PMR)	Somatic tension, sleep disturbance, peri-procedural distress	Moderate (youth & adults)	C / A / Ad	Outpatient, inpatient, oncology, peri-op, digital audio	8–12 muscle groups; 5–7 s tense / 15–20 s release; 10–15 min
Mindfulness / meditation (incl. mindful breathing; MBIs)	Anxiety/depression symptoms, emotion regulation, attention	Moderate (youth); High (adults)	C / A / Ad	School (curricula), outpatient, digital	Daily 5–10 min; class curricula 6–10 weeks with trained facilitator
Guided imagery	Procedural/needle anxiety, functional pain (RAP), peri-op pain	Moderate (youth)	C / A	Outpatient, inpatient, peri-op, dental, digital audio	8–12 min script: breath → relaxation → safe-place imagery → return
Yoga (breath + movement)	Emotional regulation, stress, attentional control	Low–Moderate (youth); Moderate (adults)	C / A / Ad	School clubs, outpatient, digital video	10–20 min sequences; breath-synchronized movement; 2–3×/week
Cognitive Behavioral Therapy (CBT)	Anxiety, OCD, depressive symptoms, coping skills	High (youth & adults)	C / A / Ad	Outpatient/telehealth; school-linked services	8–16 sessions; cognitive restructuring + skills; ERP for OCD
Behavioral therapy / Exposure	Fear/avoidance, anxiety/OCD (core mechanism)	High (within CBT)	C / A / Ad	Outpatient; specialty clinics	Psychoeducation + graded exposure; weekly with home practice
Third-wave (ACT/MBCT/DBT-skills)	Mood/anxiety, emotion regulation, values-based action	Low–Moderate (youth); Moderate–High (adults)	C / A / Ad	Outpatient; school adaptations; digital	6–12 sessions; mindfulness + acceptance + skills practice
Interpersonal Psychotherapy (IPT)	Depressive symptoms with interpersonal stressors	Moderate (adults); Low–Moderate (adolescents)	A / Ad (± C older)	Outpatient; school-based counseling	8–12 sessions; focus on role disputes/transitions, communication
Biofeedback (HRV/EMG/EEG)	Headache/migraine; attention/impulsivity (ADHD‡)	Moderate (headache); Low–Moderate (ADHD)	C / A / Ad	Outpatient specialty; digital (select)	HRV at resonance; EMG pericranial; EEG neurofeedback (specialist)
Autogenic training (AT)	General stress, tension, anxiety	Low–Moderate (youth); Moderate (adults)	C / A / Ad	Outpatient; self-practice; digital audio	6 standard formulas (heaviness/warmth/breath/heart/abdomen/forehead); 10–15 min
Clinical hypnosis	Functional abdominal pain, headaches, peri-procedural anxiety/pain	Moderate (youth)	C / A	Outpatient; peri-op; dental	3–6 sessions by trained clinician; self-hypnosis/home audio
PRISM (resilience program)	Stress, coping, goal setting in medical illness	Moderate (adolescents/YA)	A / Ad	Inpatient/outpatient oncology; telehealth	Four 30–50 min sessions: stress mgmt, goals, cognitive reframing, benefit finding
School-based MBIs (curricula)	Classroom stress, emotion/attention regulation	Moderate (youth; heterogeneous fidelity)	C / A	School day integration	5–10 min daily; 6–10 weeks; teacher training and fidelity checks

*Evidence grade is qualitative (OCEBM-informed) based on the balance of RCTs/systematic reviews in youth vs adults. †C = Children; A = Adolescents; Ad = Adults. ‡EEG neurofeedback for ADHD shows mixed effects and requires specialized equipment/providers.

Table 2. Condition-specific evidence summary (anxiety/OCD, depression, RAP/headache, peri-procedural, ADHD)

Condition	First-line non-pharmacologic options	Adjunct/alternative options	Notes on effect & implementation	Overall evidence grade*
Anxiety disorders (subclinical to clinical)	CBT with exposure (youth & adults)	Mindfulness/MBIs; breathing; PMR; guided imagery	CBT consistently superior to waitlist/usual care; breathing/mindfulness useful for state anxiety and skills generalization; school delivery feasible with training	High (CBT); Moderate (mindfulness/breathing/PMR)
Obsessive-compulsive disorder (OCD)	CBT with exposure & response prevention (ERP)	Third-wave adjuncts; family-based behavioral strategies	ERP is essential; parental involvement improves adherence; digital supports can aid homework	High (CBT/ERP); Low-Moderate (adjuncts)
Depressive symptoms	CBT; IPT (adolescents & adults)	Mindfulness-based (MBCT/meditation), behavioral activation	School-linked CBT/IPT feasible; MBCT stronger in adults; monitor safety and escalation pathways	High (adults CBT/IPT); Moderate (adolescents CBT; IPT emerging)
Functional abdominal pain (RAP)	Guided imagery; clinical hypnosis	CBT for pain coping; diaphragmatic breathing	Pediatric RCTs show reductions in pain frequency/severity; home audio supports practice	Moderate (imagery/hypnosis); Moderate (CBT for pain)
Headache/migraine (pediatric)	Biofeedback (HRV/EMG); clinical hypnosis	PMR; mindfulness/breathing	Reduced frequency/intensity; requires trained providers/equipment for biofeedback; teach home practice	Moderate (biofeedback/hypnosis); Low-Moderate (PMR/mindfulness)
Peri-procedural anxiety & pain (oncology, peri-op, dental)	PMR; guided imagery; hypnosis	Breathing; audiovisual/VR distraction; app-guided relaxation	Brief pre-procedure sessions (≤10 min) effective; VR/distraction enhances child engagement; integrate in pre-op/waiting-room flow	Moderate overall; strongest for imagery/hypnosis/PMR
ADHD & attentional regulation	Behavioral classroom supports; CBT skills (adolescents)	Mindfulness; yoga; biofeedback/neurofeedback	Mindfulness/yoga improve attention/emotion regulation; neurofeedback findings mixed and resource-intensive	Low-Moderate (mindfulness/yoga/CBT skills); Low-Moderate (neurofeedback)

*Evidence grades are qualitative summaries emphasizing youth data where available, cross-checked against adult literature when relevant.

Progressive Muscle Relaxation (PMR) is another foundational relaxation technique that teaches sequential contraction and release of large muscle groups to alleviate physical tension. It enhances body awareness and reduces autonomic arousal, contributing to symptom relief in anxiety, pain, and sleep disturbances. Trials in pediatric oncology have linked PMR with improved sleep quality and reduced procedural distress, while adult data confirm its utility in generalized anxiety and somatic symptom disorders. A typical PMR session involves gently tensing muscle groups for five to seven seconds followed by a fifteen- to twenty-second relaxation phase. Evidence supports PMR as a reliable, low-cost adjunct, meriting a moderate level of evidence strength.

Mindfulness and meditation emphasize nonjudgmental awareness of present-moment experiences. Through repeated practice, they strengthen prefrontal regulation of the amygdala, decrease rumination, and improve emotion regulation. School-based mindfulness programs for children and adolescents have demonstrated modest improvements in mood, behavior, and self-regulation, though outcomes depend on fidelity and instructor training. In adults, mindfulness-based

interventions are strongly supported by meta-analyses for reducing stress, anxiety, and depression, and for increasing gray matter density in emotion-regulating brain regions. Regular short sessions of mindful breathing or body scan practices can be easily integrated into classroom routines. The current evidence base for mindfulness approaches is robust in adults and moderately strong in younger populations.

Guided imagery utilizes imaginative visualization combined with physical relaxation to influence mood and physiological responses. Children guided to imagine calming or pleasant scenes show decreased procedural anxiety, improved coping, and reduced pain perception during medical procedures. Controlled studies have confirmed its benefits for recurrent abdominal pain and perioperative distress. Structured sessions typically involve slow breathing, progressive relaxation, and visualization of a comforting scenario before returning attention to the present environment. Guided imagery demonstrates moderate-quality evidence as an effective adjunct for managing stress and pain in pediatric populations.

Yoga, integrating controlled breathing, physical postures, and meditative focus, has gained popularity

among adolescents for its role in regulating mood, improving concentration, and enhancing body awareness. Small clinical trials suggest its usefulness for emotional regulation and behavioral control, particularly in children with attention-deficit/hyperactivity disorder. In adults, yoga shows consistent moderate effects in lowering stress and anxiety scores. Although evidence in youth remains limited, its accessibility and safety make it a promising complementary approach.

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Behavioral therapy, the precursor to CBT, focuses exclusively on modifying learned behaviors through reinforcement, modeling, and exposure without addressing underlying cognition. Exposure therapy remains particularly valuable for fear-based conditions in children, teaching graded confrontation with stress-inducing stimuli until desensitization occurs. Evidence consistently supports behavioral components as critical to treatment efficacy within broader CBT protocols, establishing high-level evidence status.

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Interpersonal Psychotherapy (IPT) targets mood disturbances linked to interpersonal stressors such as role transitions or conflicts. While evidence in adolescents is limited, controlled trials demonstrate reductions in depressive symptoms comparable to CBT when family or peer relationships are primary stress sources. IPT holds moderate evidence for

adults and emerging support for adolescent depression.

Physiological and technology-assisted techniques, including biofeedback, autogenic training, and clinical hypnosis, enable individuals to consciously regulate physiological arousal. Biofeedback, which provides real-time data on autonomic parameters such as heart rate variability, muscle tension, or EEG patterns, is effective for pediatric migraine prevention and may enhance attention in ADHD through neurofeedback protocols. Although results vary and equipment requirements limit accessibility, biofeedback demonstrates moderate evidence for headaches and emerging potential in ADHD. Autogenic training relies on repeated self-suggestions of warmth and heaviness to elicit relaxation and parasympathetic activation. Adult studies confirm its benefits for anxiety and tension symptoms, while pediatric evidence remains limited, suggesting low-to-moderate overall support. Clinical hypnosis, employing focused attention and therapeutic suggestion, has strong evidence for reducing functional abdominal pain, migraine frequency, and peri-procedural distress in children. When practiced by trained professionals, hypnosis achieves significant reductions in pain intensity and anxiety, warranting a moderate level of evidence.

Structured programs such as PRISM (Promoting Resilience in Stress Management) and school-based mindfulness curricula offer accessible frameworks for implementing stress management skills at scale. PRISM, designed for adolescents and young adults coping with chronic illness, combines stress regulation, goal setting, cognitive reframing, and benefit finding. Randomized controlled trials report enhanced resilience and improved psychological well-being. School-based mindfulness interventions integrate brief daily sessions and reflective exercises within the classroom, reducing stress and enhancing self-regulation and academic engagement when delivered consistently by trained educators. These programs have demonstrated moderate levels of evidence, particularly for fostering coping and emotional regulation in educational and healthcare contexts.

Stress management interventions have been evaluated across a range of clinical applications. For anxiety disorders and obsessive-compulsive disorder, CBT with exposure-based elements shows the strongest and most consistent effects, while mindfulness and breathing techniques provide useful adjuncts for subclinical anxiety and generalized stress. Depressive symptoms respond well to CBT and IPT, with mindfulness-based and acceptance approaches showing additional benefit in adults and emerging promise in adolescents. For functional abdominal pain and headache disorders, guided imagery, biofeedback, and hypnosis yield the most significant improvements, supporting their role

as non-pharmacologic first-line options. Peri-procedural anxiety and pain in surgical, oncology, and dental settings are effectively managed through PMR, guided imagery, hypnosis, and digital relaxation tools. In ADHD and attention regulation, mindfulness, yoga, and biofeedback demonstrate reductions in hyperactivity and improvements in focus and self-control. Collectively, these findings underscore that stress management in children, adolescents, and adults is most effective when multimodal, developmentally tailored, and integrated within educational or clinical systems.

DISCUSSION

Stress management interventions are most effective when adapted to the context in which they are implemented, considering feasibility, fidelity, and the developmental and logistical needs of the target population. In school environments, particularly K–12 settings, mindfulness-based interventions and relaxation exercises have shown promise in enhancing emotional regulation, focus, and coping skills among students. Their success depends on structured scheduling, trained facilitators, and integration within regular classroom routines rather than as isolated activities. Teachers play a central role in maintaining program fidelity; thus, proper training in mindfulness principles and stress management pedagogy is crucial. Short daily sessions of five to ten minutes are typically sufficient to yield measurable reductions in anxiety and improvements in attention and classroom behavior. Institutional support and teacher engagement remain critical for sustaining these programs and preventing implementation fatigue.

In clinical outpatient, inpatient, and waiting-room environments, stress management strategies such as brief breathing exercises, progressive muscle relaxation, guided imagery, and app-assisted relaxation are increasingly incorporated as adjuncts to standard care. These methods are feasible within short timeframes—often ten minutes or less—and can be administered by nurses, psychologists, or trained allied health professionals without disrupting clinical workflow. In pediatric and oncology settings, structured relaxation and biofeedback sessions have been used to manage peri-procedural anxiety and improve treatment compliance. Integrating these brief interventions into preoperative routines or waiting-room settings can normalize coping behaviors and reduce reliance on pharmacologic anxiolytics.

Dental clinics represent another valuable setting for stress management applications, as procedural anxiety is common in children and adolescents. Techniques such as breathing regulation, progressive muscle relaxation, distraction via audiovisual or virtual reality systems, and positive communication strategies effectively reduce pain perception and

sympathetic activation during dental procedures. Studies comparing smartphone-based relaxation training with traditional “tell-show-do” approaches indicate superior anxiety reduction with digital methods. Success in this environment relies heavily on child-friendly communication, appropriate explanation of procedures, and reinforcement of self-regulation skills before and during treatment.

Digital delivery of stress management has expanded rapidly, offering accessible interventions through smartphone applications, virtual reality environments, and biofeedback-based games. These tools replicate traditional techniques such as mindfulness, breathing, or guided imagery in engaging, interactive formats. Their scalability makes them ideal for community and school deployment, but challenges remain concerning data privacy, evidence quality, and equitable access. Many commercially available apps lack peer-reviewed validation or clinical oversight, raising concerns about efficacy and safety for minors. Future integration should therefore prioritize platforms with validated content, transparent privacy policies, and inclusion features for diverse populations.

The safe and ethical application of stress management techniques requires adequate provider training and adherence to ethical standards. Practitioners using specialized interventions such as hypnosis or biofeedback must hold appropriate credentials and operate under professional supervision. In pediatric populations, informed assent from the child and consent from caregivers are mandatory. Privacy safeguards are especially important for digital interventions, necessitating compliance with data protection laws and clear communication of data usage. Ethical practice also involves avoiding coercion, ensuring cultural sensitivity, and adapting techniques to cognitive and emotional maturity levels.

Effective implementation also depends on structured practice recommendations that align interventions with symptom profiles, age, and available resources. A step-up approach is often optimal: beginning with simple, self-directed techniques such as breathing or mindfulness for mild stress, followed by guided relaxation or imagery for somatic complaints, and advancing to structured therapies such as CBT or biofeedback for chronic or complex stress-related disorders. The minimum effective dose varies, but evidence suggests consistent short practices—five to fifteen minutes daily—over four to eight weeks produce measurable effects. Maintenance involves reinforcement through parent or teacher engagement, peer modeling, and integration into daily routines to ensure sustainability.

Future research should address key gaps, including comparative effectiveness trials that directly evaluate different relaxation modalities, dose–response

relationships, and long-term outcomes across developmental stages. There is also a need to explore hybrid digital-plus-human coaching models that combine app-based training with clinician feedback for enhanced adherence and personalization. Implementation science approaches are essential to understand barriers, optimize scalability, and ensure equity across diverse educational and healthcare systems.

CONCLUSION

In conclusion, stress management in children, adolescents, and adults benefits most from an integrated, evidence-informed approach that matches techniques to developmental capacity, context, and available support systems. Mind-body, psychological, and technology-assisted strategies all hold meaningful potential for reducing stress and improving emotional regulation when delivered with fidelity and ethical care. As modern life increasingly exposes younger populations to chronic stressors, embedding accessible relaxation and resilience-building practices in schools, clinics, and digital environments represents not only a therapeutic priority but a broader public health imperative.

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