Journal of Exploratory Research in Pharmacology **2024** vol. 9(3) | 213–222
DOI: 10.14218/JERP.2023.00008

Review Article

Cognitive-behavioral Therapy for Medical Non-adherence: A Topical Review and Clinical Recommendations

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Received: July 20, 2023 | **Revised:** May 15, 2024 | **Accepted:** June 06, 2024 | **Published online:** July 25, 2024

Abstract

Medication non-adherence among youth with chronic health conditions is a healthcare crisis in the United States. Nearly 20% of youth experience a chronic illness, yet most do not comply with their treatment regimen. Various challenges to adherence arise, such as not understanding the purpose of treatment, painful or difficult administration, forgetfulness, and mood disorders such as anxiety. Cognitive behavioral therapy (CBT) is an empirically supported approach to increasing treatment adherence. Modular CBT incorporates psychoeducation, cognitive restructuring, and behavioral experiments to promote better disease management. This article focuses on the application of CBT to four medical conditions characterized by elevated levels of non-adherence: pill-swallowing difficulties, asthma, type 1 diabetes, and inflammatory bowel disease in youth. The review integrates findings on contextual issues (e.g., ethnocultural variations, the impact of the COVID-19 pandemic), research on non-adherence, and CBT outcome studies. Additionally, limitations of the existing literature and training recommendations are provided.

Introduction

Nearly 20 percent of youth in the United States struggle with at least one chronic health condition.[1] However, medical adherence remains a widespread problem. Non-adherence is defined as "the willingness and ability of a person to follow instructions to take medications as prescribed, to attend scheduled clinic appointments, and to complete recommended investigations (p.797)".[2] Treatment burden refers to the challenges patients face when managing their disease.[3] Often, a heavy treatment burden compromises adherence to prescribed treatment routines.

Carmody *et al*.[4] found that up to 75% of youth with chronic illnesses do not adhere to their medical treatment. Non-adherence results in undesirable outcomes such as toxicity, poor functioning, and death.[4,5] Moreover, this is a costly problem, contributing to a $300 billion increase in healthcare costs.[6] Adolescents, in particular, struggle with adherence.[7] Socially, they teeter between dependence and independence, relying on caregivers to help them access healthcare while frequently coming into conflict with them.[8] Pediatric patients' lack of understanding of the need for medication, difficult or painful administration procedures, forgetfulness, and trouble taking medicine on their own compromise their disease management.[5] Therefore, effective methods to improve pediatric patients' willingness to follow prescribed regimens are necessary. Fortunately, cognitive behavioral therapy (CBT) spectrum approaches offer considerable promise for addressing misunderstandings, misperceptions, forgetfulness, and skill deficits, as well as reducing clinical sequelae associated with anxiety, depression, pain, and disruptive behaviors. This review focuses on the application of CBT to improve medical adherence in pediatric patients diagnosed with pill-swallowing difficulties, asthma, diabetes, and inflammatory bowel disease (IBD). The article integrates five key sections to achieve its aims. First, it describes the impact of contextual variables, such as sociocultural background and the disruptive influences of the COVID-19 pandemic, on pediatric patients' medication adherence. Second, it provides a brief explanation of CBT for pharmacologists who may be unfamiliar with this powerful psychosocial intervention. The third section delineates various adherence issues in pediatric patients diagnosed with pill-swallowing difficulties, asthma, type 1 diabetes (T1D), and IBD, as well as their management through CBT. Limitations of the research and future directions are outlined. Finally, the review concludes with implications for training in and delivering adherence-enhancing interventions.

Contextual variables

Pediatric patients' ability to take medication is often impacted by

Keywords: Cognitive behavioral therapy; Pediatric patients; Non-adherence; Medication; Type 1 diabetes; Asthma; Inflammatory bowel disease.

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How to cite this article: Friedberg RD, Neelley M, Zucker J, Hanna A, Mendelsohn A, Greenberger A, *et al*. Cognitive-behavioral Therapy for Medical Non-adherence: A Topical Review and Clinical Recommendations. *J Explor Res Pharmacol* 2024;9(3):213–222. doi: 10.14218/JERP.2023.00008.

age, disability, cultural background, and behavioral problems.[9] Generally, low levels of treatment adherence are more prevalent among families from marginalized communities.[10,11] Unsurprisingly, individuals from these groups report less trust in the healthcare system.[12] Language proficiency and difficulty comprehending medical jargon also affect patients and families from non-native-speaking marginalized communities.[11,13]

The COVID-19 pandemic undeniably represented a disruptive force in patients' lives.[12–17] Quarantines imposed during the pandemic disrupted routines and schedules,[18] making it difficult for patients to attend medical appointments, receive proper doses at school, and secure adequate insurance coverage.[18] Youth diagnosed with asthma, IBD, and T1D reported increased stress and adherence problems during the outbreak.[14,19–21]

Additionally, the COVID-19 crisis amplified existing health disparities.[12,13,16,18,22] Black, Indigenous, and people of color (hereinafter referred to as BIPOC) experienced greater morbidity and mortality during COVID-19.[23] These populations often had less access to healthcare, fewer opportunities for remote work, lived in crowded homes, served as front-line workers, and had pre-existing medical conditions that exacerbated viral infections.[12] Children with pediatric T1D from financially disadvantaged families suffered worse glycemic control during the pandemic due to reduced access to insulin and glucose monitoring strips.[24] Finally, during the COVID-19 pandemic, reduced healthcare capacity and disruptions in care disproportionately affected disadvantaged groups, exacerbating reduced medication adherence.[22]

In sum, CBT should be applied in a contextually responsive manner. These interventions are most effective when delivered with an understanding of existing health disparities, historical patterns of marginalization, socioeconomic status, and access to healthcare. Additionally, practitioners should consider the impact of the COVID-19 pandemic on disease management.

Brief overview of CBT

CBT is an empirically supported form of psychotherapy with a long history of treatment success for various disorders in diverse populations.[25,26] More specifically, CBT is increasingly applied to pediatric patients.[27,28] Classical, operant, and social learning theory paradigms, as well as cognitive science, form the conceptual nuclei of the approach.[27]

CBT is considered a gold standard for treating children and adolescents diagnosed with internalizing disorders.[29] Large effect sizes have been reported for reducing depression at post-test (g = 1.31), three-month follow-up (g = 1.37), and six-month follow-up (g = 1.92).[29] The same meta-analysis found robust effects for decreasing anxiety symptoms at post-test (g = 1.75), three-month (g = 1.61), six-month (g = 1.97), and one-year (g = 2.02) follow-ups. Notably, the effect sizes increased over time, reflecting good treatment durability. Externalizing disorders (e.g., behavior problems, oppositionality, aggression, non-compliance) are also well treated by CBT.[30] A brief behavioral therapy for pediatric anxiety and depression delivered in primary care settings resulted in clinical improvements in functioning (B = 0.44, $p < 0.001$, d = 0.50).[31] The effects of this brief intervention appeared stronger for anxiety ($f = 0.21$) than for depression ($f = 0.05$).[32] In sum, many interventions for medical non-adherence are based on CBT spectrum approaches.[7,33–37]

A modular approach to CBT is increasingly recommended.[38,39] Modular CBT handpicks the most powerful change-makers from the empirical literature and assembles them into conceptually homogeneous clusters. Accordingly, the model is theoretically pure yet technically eclectic. There are four intervention modules: psychoeducation, basic behavioral tasks, cognitive restructuring, and behavioral experiments. Each of these components is guided conceptually by functional analysis.

Since CBT is rooted in learning theory and cognitive science, functional analysis is a core element of the approach.[40,41] Functional analysis represents "a scientific approach to the individual".[41] Several factors are synthesized into this framework, including antecedents, target behaviors, and consequences. These elements link together to identify initiating, maintaining, and exacerbating conditions.[41] Antecedents are the stimuli that trigger and/or set the stage for target behaviors to occur. Target behaviors are the readily apparent actions that clinicians want to increase or decrease. "Private events such as thoughts, feelings, and physiological events can be entered into a functional analysis as target behaviors (p.235)".[40] Consequences include positive reinforcement, negative reinforcement, response cost procedures, and punishers. Positive and negative reinforcers make behavior more likely, whereas response cost and punishment decrease the frequency of behavior. Based on the results of the functional analysis, an intervention plan including psychoeducation, basic behavioral tasks, cognitive restructuring, and behavioral experiments is mapped out.

Psychoeducation focuses on providing information about diagnoses, presenting complaints and courses of treatment, and acquiring skills for adaptive functioning. Psychoeducation with pediatric patients diagnosed with T1D, asthma, and IBD, as well as those presenting with pill-swallowing difficulties, involves teaching patients about their clinical condition, medication benefits/side effects, and consequences of non-adherence. In CBT, skills are acquired in psychoeducation and then applied through basic behavioral tasks, cognitive restructuring, and behavioral experiment modules.

Basic behavioral tasks are procedures focused directly on pediatric patients' observable actions. They are rooted in classical, operant, and social learning foundations. Behavioral contracting and reinforcement-based interventions have a long tradition of ameliorating non-adherence.[40,42] Dialectical behavioral therapy skills such as radical acceptance and distress tolerance techniques have shown success in managing non-adherence.[34,35]

Problem-solving, self-instruction, and rational analysis are common cognitive restructuring procedures. Cognitive restructuring identifies and modifies pediatric patients' beliefs about their clinical condition, prescribed treatment regimen, and expected outcomes. Additionally, if patients are experiencing depression and anxiety, cognitive restructuring might be deployed to mitigate distress that compromises adherence.

Behavioral experiments and exposure-based interventions are designed to help young patients try out new action tendencies and develop new habits. These methods are experiential exercises that help young patients apply their acquired skills. For instance, a behavioral experiment might involve a child who does not take medication due to taste aversion being invited to chew some cinnamon-flavored gum, take the medicine, and see if the gum diluted the unpleasant taste.[43]

Applying CBT to non-adherence in pill swallowing, diabetes, asthma, and IBD

CBT applied to pill swallowing

Liquid medications are often prescribed for pediatric patients.[9]

However, tablet medications offer several advantages over liquid prescriptions,[9,44–46] including being less expensive, more convenient, and safer.[46] Liquid medications also need to be refrigerated and often taste awful.[44,45] Tablets, on the other hand, are more suitable and can be coated to mitigate taste aversion.[9] Despite these benefits, pill-swallowing difficulties are prevalent among pediatric patients, leading to additional problems,[45,47,48] such as longer hospital stays, poorer symptom control, and increased family conflict.[47] Factors contributing to pill-swallowing difficulties include fear of choking, lack of motivation, defiance, mood disturbances, and poor swallowing technique.[45]

Pill swallowing is an acquired skill, typically learned between the ages of eight to ten.[49] However, children over the age of five can usually acquire this skill relatively easily.[46] The Kidzmed project, a colorful, user-friendly, and efficient e-learning platform, was taught to student pharmacists to enhance children's pill-swallowing skills.[44,46] Post-course evaluations indicated that Kidzmed was a viable tool for orienting pharmacists to the process of teaching children swallowing skills. In an open trial investigating the feasibility of pills for children aged four to twelve, 6 mm, 8 mm, and 10 mm tablets were found to be acceptable.[9] Older children were better able to swallow pills than younger peers, but younger patients who successfully swallowed the 6 mm tablet were also able to ingest the 8 mm and 10 mm tablets. This led Bracken and colleagues to conclude there was an "association between tablet naivety and the ability to swallow the pill (p.9)".[9] Therefore, teaching children to swallow pills at an early age is recommended.[47]

Behavioral approaches, including positive reinforcement and graduated practice augmented with play, comics, and videos, have been successful in facilitating pill swallowing. Eighty-four percent of patients successfully switched from liquid to tablet medication using these methods.[46] Additionally, 87% of children learned to swallow pills in a short 14.5-m session involving behavioral techniques.[48] Typical behavioral packages aimed at improving pill swallowing include shaping, modeling, stimulus fading, and graduated exposure.[45] Sexton *et al*.[45] found that 73% of pediatric patients were able to swallow a 200 mg or larger gel cap after behavioral training. This study yielded several behavioral and self-instructional recommendations, such as using cake decorating sprinkles, putting the sprinkles in a pill case or bottle, scheduling pill-swallowing practice after a light meal, and using language like "next pill" rather than "bigger pill" when the graduated practice exercises increased in challenge level.

CBT applied to asthma management

Inhaled corticosteroids (ICSs), inhaled beta-agonists, metaproterenol, and theophylline are common medications used in pediatric asthma management.[40] However, 8% to 22% of pediatric patients do not use the inhaler correctly.[50] Poor adherence to asthma treatment leads to increased risks of exacerbations, reduced disease management, more acute care visits, higher use of rescue medications, school absences, lower quality of life, and increased financial burden.[40,51–54] Improper asthma inhaler use by pediatric patients results in $7–15 billion in lost costs.[50] When adherence levels rise to 75–80%, a cascade of positive outcomes is observed.[53]

Similar to other chronic medical conditions, adherence to asthma management routines declines during adolescence. Kaplan and Price identified several adolescent-specific factors that contribute to lower adherence rates in pediatric asthma patients.[53] These include the desire for independence, organizational difficulties, time management problems, lack of involvement in decision-making, low motivation, forgetfulness, stigma, perceptions of treatment ineffectiveness, risk-taking behavior, and the presence of comorbid psychiatric illnesses.

Culturally and linguistically diverse pediatric patients routinely demonstrate poorer adherence to asthma management protocols.[5,51] Adherence rates for asthma treatment are only 50% for children and 25% for urban minority youth.[52,55] For instance, a study examining inhaler use in Mexican and Puerto Rican pediatric patients found that 78% of the youth exhibited poor adherence, with rates higher among Puerto Rican youth than their Mexican counterparts.[51]

A peer-led program for minority adolescents living in urban areas resulted in increased quality of life and asthma control at a 15-month follow-up.[56] Jeminiwa *et al*.[52] conducted a systematic review to determine the effectiveness of eHealth interventions for increasing ICS adherence in asthma patients. They concluded that eHealth interventions are effective at improving ICS adherence compared to control interventions (SMD = 0.41, 95% CI = 0.02–0.79). mHealth interventions showed a moderate positive effect on medication adherence compared to treatment-as-usual (SMD = 0.96, 95% CI = 0.28–1.64). A pilot study investigating an mHealth intervention for urban minority youth (age of five to eleven years) combined with ICS adherence incentives found it to be feasible,[55] acceptable, and effective. Adherence improved at one-month evaluation points (95% CI [33,61], $p < 0.001$). Patients in the study carried a history of multiple hospitalizations per year (Mean = 2.9 hospitalizations, but over the evaluation period, emergency department visits and hospitalizations were dramatically reduced.

Behavioral interventions are crucial in addressing medication non-adherence.[57] A recent meta-analysis examining digital interventions containing behavioral components found that 87% of these interventions improved adherence and 53% saw improved health outcomes. The behavioral components across these projects included behavior change strategies using personalized text messages. The ADAPT program, which integrates motivation and behavioral techniques, also shows promise in increasing adherence.[54]

Sweenie *et al*.[58] conducted a meta-analysis of 24 articles concerning the treatment of asthma in underserved minoritized youth (n = 4,297; African American: 76.2%, Puerto Rican, Hispanic, Latinx: 9.5%, White: 9.5%). The 11 articles that found significant improvements included various intervention components such as tailored, individualized consultations (seven of the 11 articles, 63.6%), educational and/or behavioral elements (10 of the 11 articles, 90.9%), incorporation of family systems (seven of the 11 articles, 63.6%), healthcare system aspects (five of the 11 articles, 45.5%), technological delivery or administration (four of the 11 articles, 36.4%), and Spanish-language versions (three of the 11 articles, 27.3%). Recommended strategies included adherence tracking measures, self-monitoring skills, training in goal setting, and problem-solving. Lin *et al*.[59] conducted an adherence monitoring and behavioral intervention for children in low-income households using virtual web-based treatment, contributing to better medication adherence. Finally, the Teach-to-Goal program, which integrates psychoeducation, self-instruction, and modeling with feedback to teach proper inhaler use, showed considerable promise.[50]

CBT applied to diabetes management

Blood glucose monitoring, insulin, diet, and exercise are often prescribed to treat T1D.[40] Additionally, continuous glucose monitoring and fast glucose monitoring systems can improve glycemic control.[24,60] Nevertheless, diabetes management is particularly challenging for adolescents,[61] with recent data showing that only 17% of teens meet their glycemic thresholds.[62] Elevations in the

Generalized Anxiety Disorder and School Avoidance factors of the Screen for Child Anxiety Related Emotional Disorders are associated with poorer adherence in pediatric patients.[63]

Fortunately, CBT is considered effective in improving diabetes self-management in pediatric patients.[64] Specifically, behavioral interventions aimed at strengthening adherence patterns are supported. Various conventional and creative applications of positive reinforcement show promise. Traditional behavioral techniques, such as contingent praise, and more innovative reinforcement systems (e.g., monetary rewards, fish care supplies), yield successful outcomes.[64] In their review, Barry-Menkaus reported that the We-CAN Manage Diabetes program, which integrates problem-solving and communication training, was superior to standard care in improving glycemic control.[64,65] Moreover, a multi-family behavioral intervention focusing on communication training and education yielded beneficial results.[60] These outcomes indicate that diabetes education is most effective when combined with behavioral interventions.[64]

CBT packages resulted in good glycemic control.[66] Goal setting, coping skills, motivational interviewing, and problem-solving interventions also produced improved adherence outcomes.[61,67] Behavioral Family Systems Therapy for Diabetes (hereinafter referred to as BFST-D) fostered better adherence and glycemic control.[68,69] In a clinical study where 42% of patients improved glycemic control,[68] mean HbA1c levels decreased by 1.20% in patients with high pre-test HbA1c readings (1 standard deviation above the mean). Finally, a comprehensive package integrating BFST-D, motivational interviewing, problem-solving, cognitive restructuring, and exposure was deployed to enhance diabetes management.[70]

CBT applied to the management of IBD

IBD represents a chronic idiopathic inflammatory condition with both intestinal and extra-intestinal features, characterized by periods of relapse and remission.[71] IBD prevalence rates are estimated at 71 per 100,000 youths.[72] Medical treatment of IBD typically involves aminosalicylates, thiopurines, recombinant human erythropoietin injections, gluten-free diets, and enteral nutrition.[40] Additionally, disease management includes weekly or biweekly subcutaneous injections as well as regular endoscopies and colonoscopies.[73] Medications are designed to attenuate remission rates and heal intestinal mucosa.[72] Adherence to medical regimens for IBD requires effective disease management strategies, mindfulness of one's needs, and the capacity to navigate emotional distress.[74] However, similar to T1D and asthma, medication adherence is problematic for patients with IBD.[75–78] Sixty-six percent of pediatric patients are non-adherent to their medications.[72] In a more recent study, only 66% of adolescents properly took 80% of their oral medications.[76]

Disease management in pediatric patients is commonly compromised by stress and exposure to trigger foods.[78] Anxiety and depression moderate adherence, with increases in emotional difficulties associated with lower adherence rates.[74] Poor adherence results in many adverse sequelae, including relapses, loss of response to biological agents, increased healthcare costs, higher morbidity/mortality rates, elevated disability levels, and poorer quality of life.[71]

Attendance at medical visits by both parents and children increased their adherence.[79] Non-adherence rates also decrease when families track their progress.[79] When providers explain the rationale, dosage, and side effects of medications, conformity with treatment regimens improves.[79] A notable report found that a single counseling session delivered by pharmacists, focusing on educating adult patients diagnosed with IBD about their medications, increased receptivity to the prescriptions, and these gains were maintained two years later.[77] The counseling session contributed to increased adherence in severely non-adherent patients ($p < 0.001$). Moreover, participants in this study significantly increased their reported acceptance of medication (CI = 36.6, 69.1, $p < 0.03$). These results are important because interventions by pharmacists can be leveraged to reduce the burden on physicians.[76]

CBT holds the potential for improving adherence and reducing disease-related distress in patients diagnosed with IBD.[71,72,74,80,81] A two-session problem-solving intervention demonstrated effectiveness in improving adolescents' conformity with treatment.[72] A systematic review examining interventions reported that CBT procedures resulted in decreased disease activity and increased coping skills.[74] CBT was also recommended for pediatric patients whose beliefs about their medication or disease compromise their self-management.[36,81,82]

Limitations

Research examining the application of CBT for pediatric patients with pill-swallowing difficulties, T1D, asthma, and IBD adherence problems is an emerging area. While many studies are commendable, they have imperfections and suffer from several limitations. There is widespread criticism of the samples recruited for these studies. Multiple authors noted that the populations sampled did not adequately represent patients from traditionally marginalized groups and suffered from selection bias.[5,6,9,11,17,44,46,48,55,57,59,63,74,83–85] Thus, external validity is questionable, and the findings should be generalized with considerable caution. Specifically, diligent recruitment of BIPOC patients using creative and innovative methods is recommended.[11] Some researchers argued that the statistical analyses are flawed and/or underpowered.[6,74,86] Still others contended that the measurement methods employed were problematic.[6,50,52,57,58] Therefore, employing more sophisticated methods and experimental designs is recommended.

Key messages from the literature

The reviewed literature indicates that sociocultural contexts and emotional, cognitive, and behavioral factors impact pediatric patients' adherence to medication. Pill swallowing appears compromised by fear of choking, lack of motivation, defiance, mood disturbances, and improper swallowing technique. Incorrect use of the inhaler, time management/organizational difficulties, desire for independence, doubts about the medicine's effectiveness, sociocultural variables, as well as anxiety, depression, and disruptive behavior disorders jeopardize adherence in pediatric patients diagnosed with asthma. Good diabetes management is eroded by anxiety, pain, lack of information, and burdensome treatment requirements. Anxiety, depression, perceived treatment burden, and unsatisfactory attendance at scheduled appointments weaken adherence to treatment regimens for patients with IBD. These factors are illustrated in Figure 1.

Fortunately, modular cognitive-behavioral practices are helpful in mitigating these barriers.[37,87] By providing reliable and authoritative information, education/psychoeducation could reduce misunderstandings among pediatric patients and their caregivers, attenuate ambiguity, and increase their sense of empowerment. Basic behavioral tasks, such as reinforcement-based procedures, have a strong record of success in improving swallowing technique, cor-

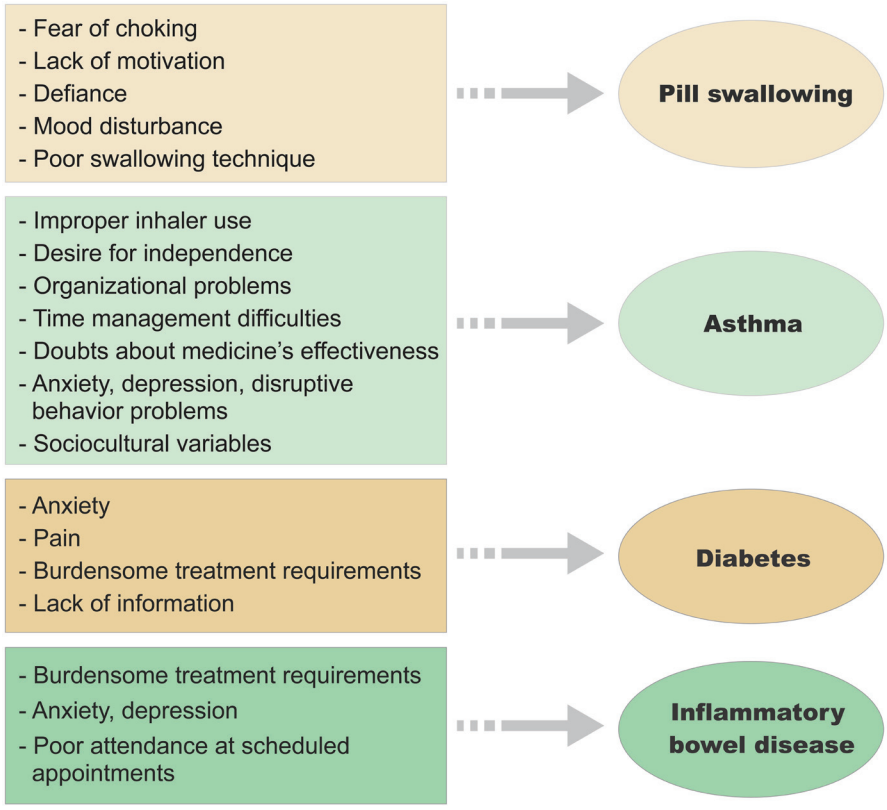

Fig. 1. Reasons for non-adherence to medical regimens for pill swallowing, asthma, diabetes, and inflammatory bowel disease. Each box represents variables that impact adherence (the arrow) to medical regimens for the various conditions indicated by the circles.

rect inhaler use, addressing low motivation, defiance/disruptive behaviors, and enhancing adherence to burdensome procedures. Cognitive restructuring appears valuable in decreasing anxiety and depression, as well as increasing acceptance of pain, which can compromise medication adherence. Exposure-based treatments are credible methods to reduce avoidance behaviors driven by fear, anxiety, and pain. Specific examples of the use of these methods are provided in the following section.

Clinical intervention and training recommendations

Methodological limitations notwithstanding, the review yields several recommendations for the clinical training of both professional therapists and individuals who are not behavioral health specialists. This section presents recommendations for psychoeducational, behavioral, cognitive restructuring, and exposure-based interventions.

Psychoeducational interventions are unobtrusive and straightforward techniques that can be readily implemented by CBT clinicians and pharmacists. For example, pharmacists, nurses, and physician assistants could be trained in psychoeducational procedures for pill swallowing.[9,11,44,49] In order to fulfill this role, simple, accessible, engaging, and creative educational materials are necessary. This information should be concise and eye-catching. The one-page handouts contained in the empirically successful MATCH-ADTC program represent an excellent model for developing useful resources.[88] The reviewed literature clearly recommends that generic behavioral interventions should be customized to patients' challenges and contexts.[37] Behavioral techniques may be more challenging for pharmacologists to apply. However, with appropriate training and consultation, it is reasonable for professionals to provide these interventions. Instruction in completing functional analysis is a necessary first step. Functional analysis tailors these procedures to individuals' unique contexts. Fortunately, instruction in functional analysis has been successfully applied to many non-behavioral health professionals and is a cornerstone of parent and teacher training programs.

Operationally defining target behaviors, learning to precisely identify the antecedents (e.g., triggers) to these actions, understanding operant principles (e.g., positive reinforcement, negative reinforcement, response cost) associated with increasing/decreasing behaviors, and practicing plotting the connection between antecedents, behaviors, and consequences are core pedagogical elements (Fig. 2). Functional analysis is akin to a Global Positioning System that carefully situates pediatric patients' behaviors within a personalized context. Figure 3 depicts a sample Functional Analysis map.

After completing the functional analysis, contingency contracts or charts can be designed to increase motivation, inhaler use, pill swallowing, and appointment attendance rates. Simply put, a contingency chart is a formalized agreement with an "If-then" provision (e.g., "If Noah takes his medication as prescribed daily, his mother will award him three points per day, which he can redeem for a reward at the end of the week").

Behavioral activation is a classic intervention aimed at improving euthymic moods.[39] This method involves developing a list of potential mood elevators, rating one's mood before engaging in

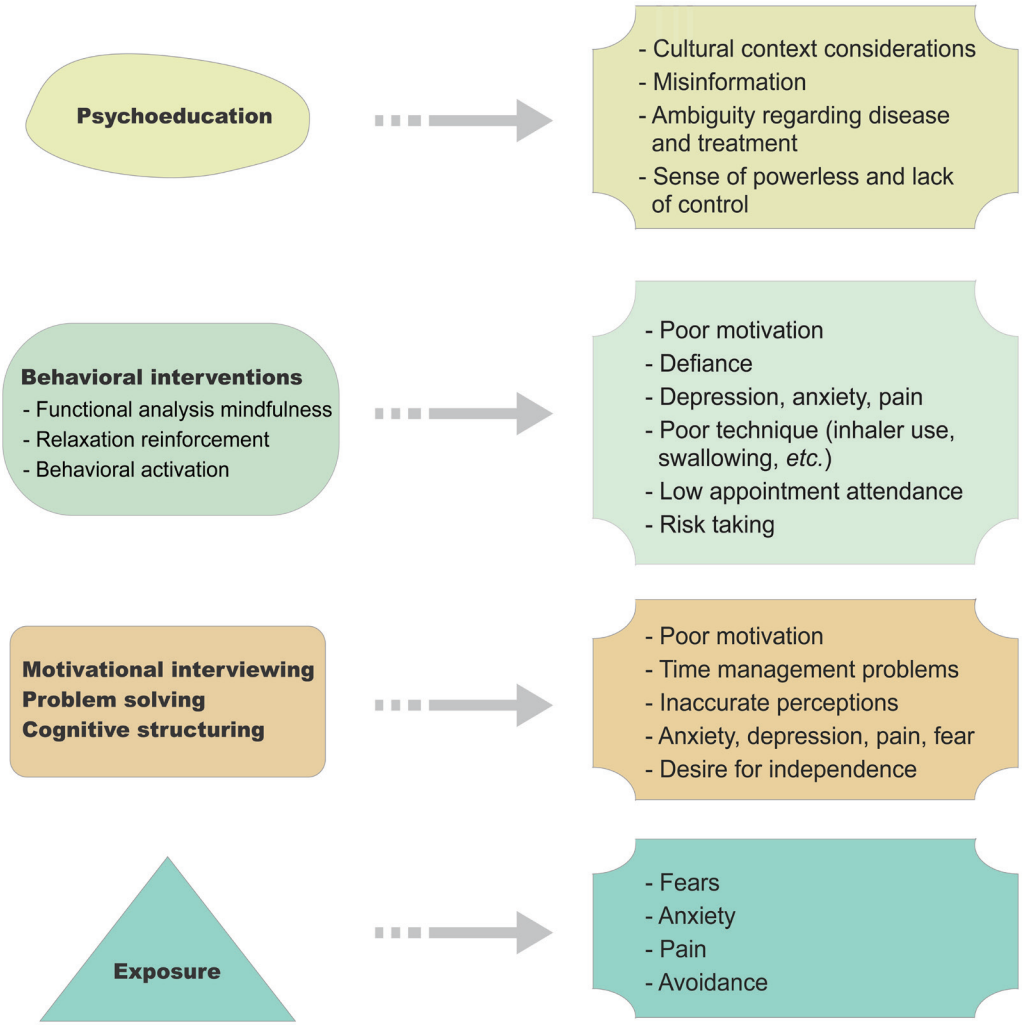

Fig. 2. Modular CBT components and their targets. Each shape on the left side of the figure contains a modular cognitive behavioral procedure that targets a specific problem (as represented by the shapes on the right side of the figure) that compromises adherence. CBT, Cognitive-behavioral Therapy.

the activity, completing the activity, rating the mood afterward, and then comparing the pre- and post-test ratings. Consequently, behavioral activation is a favorable means to decrease depressed affect and withdrawal/avoidance. Pharmacologists can expect to apply this intervention after receiving some training.

McClure and colleagues provide several basic exercises and tips to facilitate swallowing and medication adherence.[43] These techniques can be easily learned by individuals who are not behavioral health specialists. Finally, various technological aids (text reminders, apps, etc.) often enhance basic behavioral procedures.[89] These technological innovations improve access and yield real-time data, but unfortunately, they vary in quality and rely on patients' independent use.[89] Therefore, caution is advised, and familiarity with functional analysis principles is recommended when using these aids.

Competencies in motivational interviewing, problem-solving, and cognitive restructuring are more challenging to develop. Therefore, pharmacologists may wish to refer patients to behavioral health specialists when these methods are indicated. None-

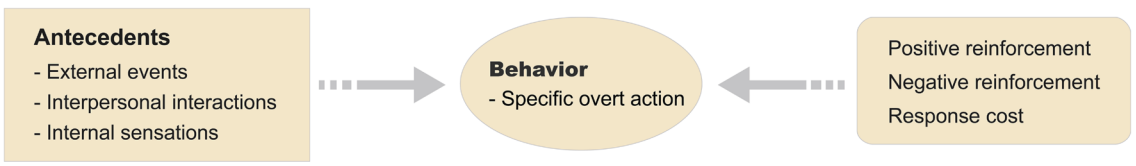

Fig. 3. Functional analysis map. This figure illustrates the basic rubric for functional analysis. Antecedents that prompt the target behaviors (e.g., the specific overt actions in the circle) are represented in the rectangular shape. The external consequences that make the behavior more or less likely to occur are in the rounded square shape on the right side. The arrows indicate that behavior is prompted by antecedents and followed by contingent reinforcements or penalties.

Table 1. Thought record example

Situation (Trigger)	Feeling	Thought
Having to keep to my prescribed meal plan	Depressed	I can't do this. It is too hard. Even if I do, it doesn't get rid of all the pain. It's hopeless.
Getting the urge to defecate while in class	Anxious	What if I have to go and I lose control or there is not a bathroom?
Taking regular biological injections	Angry	This is unfair. It hurts and it disrupts my schedule. I hate all this hassle! What a pain!!

Table 2. Example of cognitive restructuring

Situation	Feeling	Thought	Coping Thought	Re-rate Mood
Getting the urge to defecate while in class	Anxious (8)	What if I have to go to the bathroom and I lose control or there is not a bathroom.	I'm really catastrophizing. I have never lost control while in school and there are plenty of bathrooms. I just need to pay attention to my body instead of thinking the worst.	Anxiety (4)

theless, understanding how these interventions work can facilitate continuity of care. Motivational interviewing integrates empathy, goal planning, obtaining commitment, problem-solving, decisional balance techniques, and self-management.[90] The approach is delivered in a collaborative style that respects patients' autonomy and self-determination. Problem-solving is a clinical and theoretical approach related to motivational interviewing. Common rubrics for problem-solving include specifying the problem, brainstorming viable options, evaluating the long-term/short-term positive and negative consequences, and then making a productive choice among available alternatives.[43]

Cognitive restructuring focuses on reshaping pediatric patients' thoughts, conclusions, judgments, perceptions, and images.[43] The process begins with constructing a thought diary, which involves identifying triggering situations, accompanying feelings with intensity levels, and thoughts (please see Table 1). After completing the thought diary, the CBT clinician and the patient collaboratively work to develop a more accurate and adaptive appraisal. This re-evaluation process is typically done through the Socratic method.[91] Table 2 presents a thought diary with a re-engineered interpretation. Exposure is a powerful intervention that works to decrease avoidance associated with fear, anxiety, and pain.[92–94] Implementing exposure, however, requires considerable training and sophistication. The intervention typically involves creating a hierarchy of distressing items, predicting their level of threat, coaching patients to accept, tolerate, and cope with their discomfort, and comparing their expected level of vulnerability with their actual experience.[43,94] The more patients are surprised by the difference between their anticipated response and what they encountered during the exposure, the more their symptoms improve.[95]

Future directions

Dismantling studies that identify the most active intervention ingredients that produce gains in adherence are needed.[86] Additionally, comprehensive moderator and mediator analyses would be helpful to determine what works best for whom under specific conditions. Clearly, ethnocultural factors should be included as moderator variables. This approach allows for interventions to be individually tailored to patients, promoting a more personalized and precise approach.[86,87] Finally, technology-based interventions need more rigorous evaluations.

Conclusions

The research literature examining non-adherence to medical regimens reveals several challenging issues. Adherence is multi-determined and requires personalized interventions. Fortunately, CBT effectively addresses these complexities and offers an efficacious way to reduce non-adherence. Although more sophisticated studies, including moderation and mediational analyses, are necessary, CBT shows considerable promise. Accordingly, it is recommended that healthcare professionals increase their familiarity with this intervention model.

Acknowledgments

None.

Funding

There are no funding sources for this research.

Conflict of interest

Robert D. Friedberg receives book royalties from Guilford, John Wiley, Routledge, Springer, and Professional Press. He is on the speaking faculty of the Beck Institute for Cognitive Behavior Therapy and Research. He is a consultant to Kinark Child and Family Services and Syra Health. All other authors report nothing to disclose.

Author contributions

Conceptualization, research, writing, revision supervision (RDF); conceptualization, research, writing, revision (MN); research, writing (JZ, AH, AM, AG, ND). All authors agreed the final version of this manuscript.

References

[1] Blackwell CK, Elliott AJ, Ganiban J, Herbstman J, Hunt K, Forrest CB, *et al*. General Health and Life Satisfaction in Children With Chronic Illness. Pediatrics 2019;143(6):e20182988. doi:10.1542/peds.2018-2988, PMID:31061222.

[2] Murphy J, Coster G. Issues in patient compliance. Drugs 1997;54(6):797–

800. doi:10.2165/00003495-199754060-00002, PMID:9421690.
[3] van Schelven F, van der Meulen E, Wessels E, Boeije HR. Let Us Talk Treatment: Using a Digital Body Map Tool to Examine Treatment Burden and Coping Strategies Among Young People with a Chronic Condition. Patient Prefer Adherence 2023;17:517–529. doi:10.2147/PPA.S400702, PMID:36891325.
[4] Carmody JK, Denson LA, Hommel KA. Content and Usability Evaluation of Medication Adherence Mobile Applications for Use in Pediatrics. J Pediatr Psychol 2019;44(3):333–342. doi:10.1093/jpepsy/jsy086, PMID:30358863.
[5] Al-Hassany L, Kloosterboer SM, Dierckx B, Koch BC. Assessing methods of measuring medication adherence in chronically ill children-a narrative review. Patient Prefer Adherence 2019;13:1175–1189. doi:10.2147/PPA.S200058, PMID:31413546.
[6] Psihogios AM, Fellmeth H, Schwartz LA, Barakat LP. Family Functioning and Medical Adherence Across Children and Adolescents With Chronic Health Conditions: A Meta-Analysis. J Pediatr Psychol 2019;44(1):84–97. doi:10.1093/jpepsy/jsy044, PMID:29982694.
[7] Plevinsky JM, Carmody JK, Young MA. Introduction to the special issue on pediatric adherence and self-management: Topical reviews and clinical applications of evidence-based assessment and intervention. Clin Pract Pediatr Psychol 2022;10(4):357–361. doi:10.1037/cpp0000469.
[8] Hilliard ME, Eshtehardi SS, Minard CG, Wheat S, Gunn S, Sanders C, *et al*. Featured Article: Strengths-Based, Clinic-Integrated Nonrandomized Pilot Intervention to Promote Type 1 Diabetes Adherence and Well-Being. J Pediatr Psychol 2019;44(1):5–15. doi:10.1093/jpepsy/jsy051, PMID:29982765.
[9] Bracken L, McDonough E, Ashleigh S, Wilson F, Shakeshaft J, Ohia U, *et al*. Can children swallow tablets? Outcome data from a feasibility study to assess the acceptability of different-sized placebo tablets in children (creating acceptable tablets (CAT)). BMJ Open 2020;10(10):e036508. doi:10.1136/bmjopen-2019-036508, PMID:33039988.
[10] McQuaid EL, Landier W. Cultural Issues in Medication Adherence: Disparities and Directions. J Gen Intern Med 2018;33(2):200–206. doi:10.1007/s11606-017-4199-3, PMID:29204971.
[11] Williford DN, Sweenie R, Ramsey RR, McGrady ME, Crosby LE, Modi AC. Diversity, Equity, and Inclusion within Pediatric Adherence Science. J Clin Psychol Med Settings 2023;30(2):330–341. doi:10.1007/s10880-022-09922-4, PMID:36482056.
[12] Valenzuela J, Crosby LE, Harrison RR. Commentary: Reflections on the COVID-19 Pandemic and Health Disparities in Pediatric Psychology. J Pediatr Psychol 2020;45(8):839–841. doi:10.1093/jpepsy/jsaa063, PMID:32770180.
[13] Chakawa A, Belzer LT, Perez-Crawford T, Yeh HW. COVID-19, Telehealth, and Pediatric Integrated Primary Care: Disparities in Service Use. J Pediatr Psychol 2021;46(9):1063–1075. doi:10.1093/jpepsy/jsab077, PMID:34343329.
[14] Ferraro VA, Zamunaro A, Spaggiari S, Di Riso D, Zanconato S, Carraro S. Pediatric asthma control during the COVID-19 pandemic. Immun Inflamm Dis 2021;9(2):561–568. doi:10.1002/iid3.418, PMID:33657264.
[15] Friedberg RD, Thomas J, Tiller-Ormord J, Korte C, Brown K, Mendez E, *et al*. Parents' and children's intolerance of uncertainty and their reactions to COVID-19: A story of remarkable similarity. Clin Child Psychol Psychiatry 2023;28(4):1243–1256. doi:10.1177/13591045231156346, PMID:36754581.
[16] Korte C, Friedberg RD, Wilgenbusch T, Paternostro JK, Brown K, Kakolu A, *et al*. Intolerance of Uncertainty and Health-Related Anxiety in Youth amid the COVID-19 Pandemic: Understanding and Weathering the Continuing Storm. J Clin Psychol Med Settings 2022;29(3):645–653. doi:10.1007/s10880-021-09816-x, PMID:34478037.
[17] Valenzuela JM, Dimentstein K, Yee S, Pan B, Snyder MC, Wolf RM. Psychosocial Impact of the COVID-19 Pandemic in Racially/Ethnically Diverse Youth With Diabetes. J Pediatr Psychol 2023;48(1):17–28. doi:10.1093/jpepsy/jsac070, PMID:36137256.
[18] Plevinsky JM, Young MA, Carmody JK, Durkin LK, Gamwell KL, Klages KL, *et al*. The Impact of COVID-19 on Pediatric Adherence and Self-Management. J Pediatr Psychol 2020;45(9):977–982. doi:10.1093/jpepsy/jsaa079, PMID:32929482.
[19] Dorfman L, Nassar R, Binjamin Ohana D, Oseran I, Matar M, Shamir R, *et al*. Pediatric inflammatory bowel disease and the effect of COVID-19 pandemic on treatment adherence and patients' behavior. Pediatr Res 2021;90(3):637–641. doi:10.1038/s41390-020-01312-6, PMID:33446913.
[20] Moore H, Abadula F, Garretson S, Okonkwo N, Streisand R, Jaser S. A Pandemic Perspective: Analyzing the Impact of COVID-19 on Diabetes Management and Mood Through the Lens of Location and Family Conflict. Sci Diabetes Self Manag Care 2022;48(3):157–162. doi:10.1177/26350106221094525, PMID:35446187.
[21] O'Donnell MB, Hilliard ME, Cao VT, Bradford MC, Barton KS, Hurtado S, *et al*. "It Just Kind of Feels Like a Different World Now:" Stress and Resilience for Adolescents With Type 1 Diabetes in the Era of COVID-19. Front Clin Diabetes Healthc 2022;3:835739. doi:10.3389/fcdhc.2022.835739, PMID:36992786.
[22] Hartmann-Boyce J, Gunnell J, Drake J, Otunla A, Suklan J, Schofield E, *et al*. Asthma and COVID-19: review of evidence on risks and management considerations. BMJ Evid Based Med 2021;26:195. doi:10.1136/bmjebm-2020-111506, PMID:32883705.
[23] Phillips N, Park IW, Robinson JR, Jones HP. The Perfect Storm: COVID-19 Health Disparities in US Blacks. J Racial Ethn Health Disparities 2021;8(5):1153–1160. doi:10.1007/s40615-020-00871-y, PMID:32965660.
[24] Shi Y, Wu LQ, Wei P, Liao ZH. Children with type 1 diabetes in COVID-19 pandemic: Difficulties and solutions. World J Clin Pediatr 2022;11(5):408–418. doi:10.5409/wjcp.v11.i5.408, PMID:36185098.
[25] Beck AT, Rush AJ, Shaw BF, Emery G. Cognitive therapy of depression. New York, NY: New Guildford Press; 1979.
[26] Beck AT, Emery G, Greenberg RL. Anxiety disorders and phobias: A cognitive perspective. New York, NY: Plenum Press; 1985.
[27] Friedberg RD, McClure JM. Clinical practice of cognitive therapy with children and adolescents. 2nd ed. New York, NY: Guilford; 2015.
[28] Friedberg RD, Paternostro JK. Cognitive behavioral therapy with youth: Essential foundations and elementary practices. In: Friedberg RD, Paternostro JK (eds). Handbook of Cognitive Behavioral Therapy for Pediatric Medical Conditions. Cham, Switzerland: Springer Nature; 2019:87–101.
[29] Rith-Najarian LR, Mesri B, Park AL, Sun M, Chavira DA, Chorpita BF. Durability of Cognitive Behavioral Therapy Effects for Youth and Adolescents With Anxiety, Depression, or Traumatic Stress:A Meta-Analysis on Long-Term Follow-Ups. Behav Ther 2019;50(1):225–240. doi:10.1016/j.beth.2018.05.006, PMID:30661562.
[30] Riise EN, Wergeland GJH, Njardvik U, Öst LG. Cognitive behavior therapy for externalizing disorders in children and adolescents in routine clinical care: A systematic review and meta-analysis. Clin Psychol Rev 2021;83:101954. doi:10.1016/j.cpr.2020.101954, PMID:33418192.
[31] Weersing VR, Brent DA, Rozenman MS, Gonzalez A, Jeffreys M, Dickerson JF, *et al*. Brief Behavioral Therapy for Pediatric Anxiety and Depression in Primary Care: A Randomized Clinical Trial. JAMA Psychiatry 2017;74(6):571–578. doi:10.1001/jamapsychiatry.2017.0429, PMID:28423145.
[32] Brent DA, Porta G, Rozenman MS, Gonzalez A, Schwartz KTG, Lynch FL, *et al*. Brief Behavioral Therapy for Pediatric Anxiety and Depression in Primary Care: A Follow-up. J Am Acad Child Adolesc Psychiatry 2020;59(7):856–867. doi:10.1016/j.jaac.2019.06.009, PMID:31278996.
[33] Lemanek KL, Yardley H. Noncompliance and nonadherence. In: Friedberg RD, Paternostro JK (eds). Handbook of Cognitive Behavioral Therapy for Pediatric Medical Conditions. Chaim, Switzerland: Springer Nature; 2019:407–418.
[34] Lois BH, Miller AL. Stopping the non-adherence cycle: The clinical and theoretical basis for dialectical behavior therapy adapted for adolescents with chronic medical illness (DBT-CMI). Cogn Behav Pract 2017;25:32–43. doi:10.1016/j.cbpra.2017.01.006.
[35] Lois BH, Corcoran VP, Miller AL. DBT adaptations with pediatric populations. In: Friedberg RD, Paternostro JK (eds). Handbook of Cognitive Behavioral Therapy for Pediatric Medical Conditions. Cham, Switzerland: Springer Nature; 2019:137–150.
[36] Reed B, Buzenski J, van Tilburg MAL. Implementing psychological therapies for gastrointestinal disorders in pediatrics. Expert Rev Gastroenterol Hepatol 2020;14(11):1061–1067. doi:10.1080/17474124.2020.1806055, PMID:32749161.

[37] Rohan JM, Verma T. Psychological Considerations in Pediatric Chronic Illness: Case Examples. Int J Environ Res Public Health 2020;17(5):1644. doi:10.3390/ijerph17051644, PMID:32138373.
[38] Friedberg RD, Gorman AA, Hollar-Wilt L, Biuckians A, Murray M. Cognitive behavioral therapy for the busy child psychiatrist and other mental health professional. New York: Routledge; 2011.
[39] Friedberg RD, Thordarson MA. Cognitive behavior therapy. In: Matson JL (ed). Handbook of Childhood Psychopathology and Developmental Disabilities. Chaim, Switzerland: Springer Nature; 2018:87–102.
[40] Rapoff MA, Duncan CA, Karlson C. Adherence to pediatric regimens. 3rd ed. New York, NY: Springer; 2003.
[41] Yoman J. A primer on functional analysis. Cogn Behav Pract 2008;15(3):325–340. doi:10.1016/j.cbpra.2008.01.002.
[42] Driscoll KA, Modi AC. Introduction. In: Modi AC, Driscoll KA (eds). Adherence and Self-management in Pediatric Populations. New York, NY: Academic Press; 2020:1–23.
[43] McClure JM, Friedberg RD, Thordarson MA, Keller M. Cognitive behavioral therapy-Express. New York, NY: Guilford; 2019.
[44] McCloskey AP, Lunn A, Traynor MJ, Lim EJ, Tse Y, McCabe PG, *et al*. KidzMed e-learning to upskill student pharmacists to teach pill swallowing to children. PLoS One 2023;18(3):e0282070. doi:10.1371/journal.pone.0282070, PMID:36928840.
[45] Sexton V, Czyzewski D, Cuttita K, Self MM. Pill-swallowing training in pediatric psychology practice: Applied intervention to promote adherence to oral medication. Clin Pract Pediatr Psychol 2022;10(4):428–439. doi:10.1037/cpp0000460.
[46] Tse Y, Vasey N, Dua D, Oliver S, Emmet V, Pickering A, *et al*. The KidzMed project: teaching children to swallow tablet medication. Arch Dis Child 2020;105(11):1105–1107. doi:10.1136/archdischild-2019-317512, PMID:31594776.
[47] Patel A, Jacobsen L, Jhaveri R, Bradford KK. Effectiveness of pediatric pill swallowing interventions: a systematic review. Pediatrics 2015;135(5):883–889. doi:10.1542/peds.2014-2114, PMID:25896843.
[48] Rashed AN, Terry D, Fox A, Christiansen N, Tomlin S. Feasibility of developing children's Pill School within a UK hospital. Arch Dis Child 2021;106(7):705–708. doi:10.1136/archdischild-2020-319154, PMID:33229414.
[49] Smith L, Leggett C, Borg C. Administration of medicines to children: a practical guide. Aust Prescr 2022;45(6):188–192. doi:10.18773/austprescr.2022.067, PMID:36479324.
[50] Volerman A, Kan K, Carpenter D, Press VG. Strategies for Improving Inhalation Technique in Children: A Narrative Review. Patient Prefer Adherence 2021;15:665–675. doi:10.2147/PPA.S267053, PMID:33824582.
[51] Arcoleo KJ, McGovern C, Kaur K, Halterman JS, Mammen J, Crean H, *et al*. Longitudinal Patterns of Mexican and Puerto Rican Children's Asthma Controller Medication Adherence and Acute Healthcare Use. Ann Am Thorac Soc 2019;16(6):715–723. doi:10.1513/AnnalsATS.201807-462OC, PMID:30860858.
[52] Jeminiwa R, Hohmann L, Qian J, Garza K, Hansen R, Fox BI. Impact of eHealth on medication adherence among patients with asthma: A systematic review and meta-analysis. Respir Med 2019;149:59–68. doi:10.1016/j.rmed.2019.02.011, PMID:30803887.
[53] Kaplan A, Price D. Treatment Adherence in Adolescents with Asthma. J Asthma Allergy 2020;13:39–49. doi:10.2147/JAA.S233268, PMID:32021311.
[54] Kosse RC, Bouvy ML, de Vries TW, Koster ES. Effect of a mHealth intervention on adherence in adolescents with asthma: A randomized controlled trial. Respir Med 2019;149:45–51. doi:10.1016/j.rmed.2019.02.009, PMID:30803885.
[55] Kenyon CC, Sundar KG, Gruschow SM, Quarshie WO, Feudtner C, Bryant-Stephens TC, *et al*. Tailored medication adherence incentives for high-risk children with asthma: a pilot study. J Asthma 2020;57(12):1372–1378. doi:10.1080/02770903.2019.1648503, PMID:31389724.
[56] Rhee H, Love T, Wicks MN, Tumiel-Berhalter L, Sloand E, Harrington D, *et al*. Long-term Effectiveness of a Peer-Led Asthma Self-management Program on Asthma Outcomes in Adolescents Living in Urban Areas: A Randomized Clinical Trial. JAMA Netw Open 2021;4(12):e2137492. doi:10.1001/jamanetworkopen.2021.37492, PMID:34874404.
[57] Ramsey RR, Plevinsky JM, Kollin SR, Gibler RC, Guilbert TW, Hommel KA. Systematic Review of Digital Interventions for Pediatric Asthma Management. J Allergy Clin Immunol Pract 2020;8(4):1284–1293. doi:10.1016/j.jaip.2019.12.013, PMID:31870809.
[58] Sweenie R, Keyser HH, Gutiérrez-Colina AM, Brammer C, Ramsey RR. Adherence and Self-management Interventions among Systemically Marginalized and Underserved Youth with Asthma. Clin Pract Pediatr Psychol 2022;10(4):394–408. doi:10.1037/cpp0000462, PMID:37275278.
[59] Lin NY, Ramsey RR, Miller JL, McDowell KM, Zhang N, Hommel K, *et al*. Telehealth delivery of adherence and medication management system improves outcomes in inner-city children with asthma. Pediatr Pulmonol 2020;55(4):858–865. doi:10.1002/ppul.24623, PMID:31905264.
[60] Hilliard ME, Commissariat PV, Kanapka L, Laffel LM, Levy W, Harrington K, *et al*. Development and delivery of a brief family behavioral intervention to support continuous glucose monitor use in young children with type 1 diabetes. Pediatr Diabetes 2022;23(6):792–798. doi:10.1111/pedi.13349, PMID:35446449.
[61] Aljawarneh YM, Al-Qaissi NM, Ghunaim HY. Psychological interventions for adherence, metabolic control, and coping with stress in adolescents with type 1 diabetes: a systematic review. World J Pediatr 2020;16(5):456–470. doi:10.1007/s12519-020-00352-6, PMID:32185668.
[62] American Diabetes Association. 13. Children and Adolescents: Standards of Medical Care in Diabetes-2020. Diabetes Care 2020;43(Suppl 1):S163–S182. doi:10.2337/dc20-S013, PMID:31862756.
[63] Raj R, Nguyen M, Pozzo AM, Marsac ML, Vselvoshakaya O, Meadows AL. Effects of Trauma and Anxiety on Adherence in Pediatric Type 1 Diabetes. Diabetes Spectr 2022;35(2):171–178. doi:10.2337/ds21-0024, PMID:35668893.
[64] Barry-Menkhaus SA, Wagner DV, Riley AR. Small Interventions for Big Change: Brief Strategies for Distress and Self-Management Amongst Youth with Type 1 Diabetes. Curr Diab Rep 2020;20(1):3. doi:10.1007/s11892-020-1290-7, PMID:32002682.
[65] Hilliard ME, Powell PW, Anderson BJ. Evidence-based behavioral interventions to promote diabetes management in children, adolescents, and families. Am Psychol 2016;71(7):590–601. doi:10.1037/a0040359, PMID:27690487.
[66] Rechenberg K, Koerner R. Cognitive Behavioral Therapy in Adolescents with Type 1 Diabetes: An Integrative Review. J Pediatr Nurs 2021;60:190–197. doi:10.1016/j.pedn.2021.06.019, PMID:34224937.
[67] Caccavale LJ, Monaghan M. Behavioral interventions for youth with diabetes. J Health Serv Psychol 2020;46(3):109–117. doi:10.1007/s42843-020-00014-1.
[68] Carpenter JL, Price JEW, Cohen MJ, Shoe KM, Pendley JS. Multifamily group problem-solving intervention for adherence challenges in pediatric insulin-dependent diabetes. Clin Pract Pediatr Psychol 2014;2(2):101–115. doi:10.1037/cpp0000059.
[69] Wysocki T, Harris MA, Buckloh LM, Mertlich D, Lochrie AS, Taylor A, *et al*. Effects of behavioral family systems therapy for diabetes on adolescents' family relationships, treatment adherence, and metabolic control. J Pediatr Psychol 2006;31(9):928–938. doi:10.1093/jpepsy/jsj098, PMID:16401678.
[70] Carpenter JL, Cammarata C. Cognitive behavioral therapy for children and adolescents with diabetes. In: Friedberg RD, Paternostro JK (eds). Handbook of Cognitive Behavioral Therapy for Pediatric Medical Conditions. Cham, Switzerland: Springer Nature; 2019:329–344.
[71] Chan W, Chen A, Tiao D, Selinger C, Leong R. Medication adherence in inflammatory bowel disease. Intest Res 2017;15(4):434–445. doi:10.5217/ir.2017.15.4.434, PMID:29142511.
[72] Greenley RN, Gumidyala AP, Nguyen E, Plevinsky JM, Poulopoulos N, Thomason MM, *et al*. Can You Teach a Teen New Tricks? Problem Solving Skills Training Improves Oral Medication Adherence in Pediatric Patients with Inflammatory Bowel Disease Participating in a Randomized Trial. Inflamm Bowel Dis 2015;21(11):2649–2657. doi:10.1097/MIB.0000000000000530, PMID:26218142.
[73] Plevinsky JM, Greenley RN, Fishman LN. Self-management in pa-

tients with inflammatory bowel disease: strategies, outcomes, and integration into clinical care. Clin Exp Gastroenterol 2016;9:259–267. doi:10.2147/CEG.S106302, PMID:27601930.

[74] Tran L, Mulligan K. A Systematic Review of Self-Management Interventions for Children and Adolescents With Inflammatory Bowel Disease. Inflamm Bowel Dis 2019;25(4):685–698. doi:10.1093/ibd/izy299, PMID:30295786.

[75] Gohil S, Majd Z, Sheneman JC, Abughosh SM. Interventions to improve medication adherence in inflammatory bowel disease: A systematic review. Patient Educ Couns 2022;105(7):1731–1742. doi:10.1016/j.pec.2021.10.017, PMID:34736829.

[76] Lim JK, Lee YJ, Park JH. Medication-Related Knowledge and Medication Adherence in Pediatric and Adolescent Patients with Inflammatory Bowel Disease. J Korean Med Sci 2020;35(14):e92. doi:10.3346/jkms.2020.35.e92, PMID:32281312.

[77] Tiao DK, Chan W, Jeganathan J, Chan JT, Perry J, Selinger CP, *et al*. Inflammatory Bowel Disease Pharmacist Adherence Counseling Improves Medication Adherence in Crohn's Disease and Ulcerative Colitis. Inflamm Bowel Dis 2017;23(8):1257–1261. doi:10.1097/MIB.0000000000001194, PMID:28719539.

[78] Vernon-Roberts A, Rouse E, Gearry RB, Day AS. Systematic Review of Self-Management Assessment Tools for Children With Inflammatory Bowel Disease. JPGN Rep 2021;2(3):e075. doi:10.1097/PG9.0000000000000075, PMID:37205965.

[79] Barker DH, Shapiro JM, Lobato D, McQuaid EL, Leleiko NS. Challenges and Approaches to Assessing Medication Adherence in Pediatric Inflammatory Bowel Diseases. J Pediatr Gastroenterol Nutr 2020;70(6):759–761. doi:10.1097/MPG.0000000000002727, PMID:32443027.

[80] Gravina AG, Pellegrino R, Palladino G, Mazzarella C, Federico P, Arboretto G, *et al*. Targeting the gut-brain axis for therapeutic adherence in patients with inflammatory bowel disease: a review on the role of psychotherapy. Brain-Apparatus Communication: A Journal of Bacomics 2023;2(1):2181101. doi:10.1080/27706710.2023.2181101.

[81] Korte C, Friedberg RD. Cognitive behavioral therapy for comorbid functional gastrointestinal disorders and anxiety: Systematic review and clinical applications. J Clin Exp Gastroenterol 2023;2(1):19–26. doi:10.46439/gastro.2.014.

[82] Greenley RN, Reed-Knight B, Wojtowicz AA, Plevinsky JM, Lewis JD, Kahn SA. A bitter pill to swallow: Medication adherence barriers in adolescents and young adults with inflammatory bowel diseases. Child Health Care 2018;47(4):416–431. doi:10.1080/02739615.2017.1383911.

[83] Kvarnström K, Westerholm A, Airaksinen M, Liira H. Factors Contributing to Medication Adherence in Patients with a Chronic Condition: A Scoping Review of Qualitative Research. Pharmaceutics 2021;13(7):1100. doi:10.3390/pharmaceutics13071100, PMID:34371791.

[84] Papadopoulos NG, Custovic A, Deschildre A, Mathioudakis AG, Phipatanakul W, Wong G, *et al*. Impact of COVID-19 on Pediatric Asthma: Practice Adjustments and Disease Burden. J Allergy Clin Immunol Pract 2020;8(8):2592–2599.e3. doi:10.1016/j.jaip.2020.06.001, PMID:32561497.

[85] Plevinsky JM, Wojtowicz AA, Miller SA, Greenley RN. Longitudinal Barriers to Thiopurine Adherence in Adolescents With Inflammatory Bowel Diseases. J Pediatr Psychol 2019;44(1):52–60. doi:10.1093/jpepsy/jsy062, PMID:30137372.

[86] Fidler A, Sweenie R, Ortega A, Cushing CC, Ramsey R, Fedele D. Meta-Analysis of Adherence Promotion Interventions in Pediatric Asthma. J Pediatr Psychol 2021;46(10):1195–1212. doi:10.1093/jpepsy/jsab057, PMID:34343294.

[87] Lebowitz ER, Zilcha-Mano S. Not so common anymore? Beyond the common factor understanding of the role of alliance in youth psychotherapy. Clin Psychol: Sci Pract 2022;29(2):140–142. doi:10.1037/cps0000088.

[88] Chorpita BF, Weisz JR. Modular approach to therapy for children with anxiety, depression, trauma or conduct problems (MATCH-ADTC). Satellite Beach, FL: Practicewise; 2009.

[89] Noser AE, Lancaster BD, Hommel KA, Roberts CM, King JA, Alt E, *et al*. Use of Behavior Change Techniques and Quality of Commercially Available Inflammatory Bowel Disease Apps. Dig Dis Sci 2023;68(7):2908–2920. doi:10.1007/s10620-023-07884-7, PMID:36933116.

[90] Miller WR, Rollnick S. Motivational Interviewing: Helping People Change 3rd ed. New York: Guilford; 2013.

[91] Friedberg RD. Chasing Janus: Socratic dialogue with children and adolescents. In: Padesky CA, Kennerley H (eds). Dialogues for Discovery. Oxford: Oxford University Press; 2023:371–401.

[92] Tolin DF. Inhibitory learning for anxiety-related disorders. Cog Behav Pract 2019;26:225–236. doi:10.1016/j.cbpra.2018.07.008.

[93] Friedberg RD. Where's the beef: Concrete elements in supervision with CBT with youth. J Am Acad Child Adolesc Psychiatr 2015;54:527–531.

[94] McGuire JF, Storch EA. An Inhibitory Learning Approach to Cognitive-Behavioral Therapy for Children and Adolescents. Cogn Behav Pract 2019;26(1):214–224. doi:10.1016/j.cbpra.2017.12.003, PMID:31205406.

[95] Bjork RA, Bjork EL. Desirable difficulties in theory and practice. J App Res Mem Cogn 2020;9(4):475–479.