Published in final edited form as:

Sch Psychol. 2019 November ; 34(6): 665–676. doi:10.1037/spq0000310.

COPE for Asthma: Outcomes of a Cognitive Behavioral Intervention for Children With Asthma and Anxiety

Colleen Marie McGovern,
The Ohio State University

Kimberly Arcoleo,
University of Rochester

Bernadette Melnyk
The Ohio State University

Abstract

Asthma is the most common childhood chronic condition and a major contributor to school absences and lost instructional time. Children with asthma have a higher risk of internalizing disorders, such as anxiety and depression, which can further complicate asthma management. The purpose of this pilot study was to assess the feasibility, acceptability, and preliminary effects of a manualized, cognitive-behavioral skills-building intervention for children with asthma and anxiety. The design for this study was a one-group, pre/posttest preexperimental with a 6-week follow-up. This article presents the immediate posttest follow-up results. Children between 8 and 12 years of age and their caregivers were recruited from three elementary schools in a large public school district in Ohio. Thirty-two children with asthma and symptoms of anxiety completed the Creating Opportunities for Personal Empowerment (COPE) for Asthma program. Caregivers completed surveys, but they did not participate in the intervention. Results indicated that the program was feasible to implement in small groups during the school day. Self-reported findings indicated a significant reduction in separation anxiety and increased personal beliefs, child-management self-efficacy, and asthma illness representations. Parents and caregivers reported symptom reduction in their children on the Pediatric Symptom Checklist. The subgroup of children scoring high on anxiety at baseline showed reductions with the intervention, having large positive effect sizes for separation and social anxiety as well as medium and large positive effect sizes on the personal beliefs and asthma illness representations, respectively.

Keywords

chronic conditions; theory-based intervention; school-based intervention; childhood asthma

Correspondence concerning this article should be addressed to Colleen Marie McGovern, who is now at School of Nursing, University of North Carolina - Chapel Hill, Carrington Hall, Room 4008, Campus Box 7460, 120 North Medical Drive, Chapel Hill, NC 27510-7460. mcgovern@unc.edu.

Colleen Marie McGovern, College of Nursing, The Ohio State University; Kimberly Arcoleo, School of Nursing, University of Rochester; Bernadette Melnyk, College of Nursing and College of Medicine, The Ohio State University.

Asthma is the most common childhood chronic condition in the United States, affecting 7.1 million children (Akinbami, Simon, & Rossen, 2016; American Lung Association, 2014). Not only is childhood asthma a major contributor to school absences and lost instructional time, children with asthma are at higher risk of having internalizing disorders, such as anxiety and depression, compared to children without asthma (Centers for Disease Control and Prevention, 2015; Goodwin et al., 2013; Lu et al., 2012). The prevalence rates of having asthma and comorbid anxiety range from 22% to 49% (Dudeney, Sharpe, Jaffe, Jones, & Hunt, 2017; Ortega, Huertas, Canino, Ramirez, & Rubio-Stipec, 2002), which can lead to a lower quality of life as well as higher morbidity and mortality rates (Feldman et al., 2005; Strunk, Mrazek, Fuhrmann, & LaBrecque, 1985). Despite numerous adverse outcomes, there is a lack of scalable evidence-based interventions for this high-risk population.

In general, better health has been associated with higher academic achievement (Minkkinen et al., 2017), and severe asthma has been associated with negative cognitive effects and academic outcomes (Irani, Barbone, Beausoleil, & Gerald, 2017). Asthma symptoms can disrupt and negatively affect sleep, which has been associated with drowsiness in class and inaccurate schoolwork (American Thoracic Society, 2013). A recent report by the National Center for Chronic Disease Prevention and Health Promotion (2017) found that children with asthma, coupled with other factors such as low-income or minority status, had a higher risk of being held back a grade in school. Other studies have reported mixed results related to academic achievement (Moonie, Sterling, Figgs, & Castro, 2008; Sturdy et al., 2012). Improved asthma control can contribute to fewer school absences (Hsu, Qin, Beavers, & Mirabelli, 2016), and may allow students to focus on schoolwork without preoccupation with breathing or fear of an asthma attack.

Schools are an ideal setting for implementation of evidence-based interventions due to the number of hours students spend there each day. Transportation to attend intervention programs is also less of a barrier in schools than in clinical settings. Small group interventions in schools are a viable approach to reaching more children than working with them individually. Additionally, Stewart, Masuda, Letourneau, Anderson, and McGhan (2011) conducted a qualitative study revealing school-aged youth with asthma and allergies appreciate peer support. This further supports the use of small groups in the school setting.

Previous reviews have called for rigorous research to address asthma and psychological outcomes because asthma with comorbid anxiety/depression leads to poor health outcomes for children and, long term, a higher risk of cardiovascular disease due to heightened chronic inflammation (Al Aloom, Naik-Panvelkar, Nissen, & Saini, 2014; Ritz, Meuret, Trueba, Fritzsche, & Von Leupoldt, 2013; Shanahan, Copeland, Worthman, Angold, & Costello, 2013). Studies have indicated that, not only are children with asthma and anxiety/depression less likely to adhere to treatment guidelines, they are prone to a misinterpretation of their symptoms, leading to overuse of their quick-relief inhaler (Feldman et al., 2013). Manifestations of anxiety and asthma are often confused by the individual experiencing the symptoms (Goodwin et al., 2013). Furthermore, psychological factors can be a trigger for asthma symptoms or an asthma attack (Lee, Lee, Lai, Chen, & Stewart, 2016). Improvement in symptom interpretation, asthma self-efficacy, and asthma illness beliefs has been associated with better asthma control (Feldman et al., 2012). The current study was

conceptualized because of a paucity of evidence-based intervention studies conducted in schools targeting children with comorbid asthma and anxiety and/or depressive symptoms.

Theoretical Framework

The conceptual model for this study embeds a cognitive–behavioral skills-building (CBSB) intervention into the integrated common-sense model (CSM) of illness representation (IR) and cognitive theory (CT). The CSM of IR is a theoretical approach for individuals with a chronic illness (Leventhal, Diefenbach, & Leventhal, 1992). Figure 1 illustrates the feedback loop for how individuals with a chronic illness develop concurrent cognitive and emotional representations of their condition (Leventhal et al., 1992). The process is initiated by a situational stimulus (e.g., asthma symptoms), which informs the cognitive (e.g., “I have experienced these symptoms before when I needed my inhaler”) and emotional (e.g., “this scares me because I cannot catch my breath; I might die”) representations. The individual will then select a coping mechanism based on past experiences (e.g., uses quick relief inhaler and may feel reassured that this helped previously). Finally, the individual appraises whether those actions resulted in relief of symptoms. This process is retained in memory so that the next time (s)he experiences those same symptoms, (s)he recalls what (s)he thought, how (s)he felt, what actions (s)he took, and the success or failure of those actions to alleviate asthma symptoms—hence the feedback loop of IR. For individuals with anxiety, this system can become derailed due to unrealistic/extreme thoughts about the severity of the symptoms.

CT posits that an individual’s perceptions (i.e., quick, evaluative automatic thoughts or beliefs) of events shape feelings and behaviors (Beck, 2011). This is known as the thoughts, feelings, and behavior triangle (see Figure 2). Cognitive–behavioral therapy (CBT), based on CT, is a short, goal-oriented approach and is the gold standard treatment for mild to moderate depression and anxiety (National Institute of Mental Health, 2015a, 2015b). CBT targets negative or distorted thoughts (e.g., “I forgot to use my controller medication this morning, so why bother taking it at all?”), to reframe them in a more accurate and positive light to improve the health and well-being of the individual. In the example above, the distorted thought could be changed to “I may have forgotten to use my controller medication this morning, but I will make sure to use it tonight, so I don’t start wheezing.”

The goal of the Creating Opportunities for Personal Empowerment (COPE) for Asthma intervention is to enhance children’s self-efficacy and ability to cope with the stresses and challenges associated with their asthma, thereby reducing anxiety/depressive symptoms. The COPE for Asthma intervention targets providing accurate asthma education integrated with CBSB to improve children’s understanding about the management of their asthma to be more in line with the professional model of asthma (i.e., that asthma is a chronic condition instead of episodic). The intervention also helps children build and use cognitive–behavioral skills (changing negative thoughts to positive thoughts, using positive self-talk, activities to stay in the moment, guided imagery, goal-setting, and problem-solving). Please see Figure 3 for the conceptual framework. The specific aims of this study were to (1) assess the feasibility and acceptability of the seven-session COPE for Asthma intervention for children with persistent asthma and elevated symptoms of anxiety/depression delivered in group format in schools, and (2) examine the preliminary efficacy of the COPE for Asthma

program on anxiety and depressive symptoms, asthma management self-efficacy, symptom interpretation, asthma IRs, controller medication adherence, asthma-related quality of life (QOL), health care utilization, and asthma control.

Methods

Participants

A convenience sample of 30 child participants and their CGs were targeted. This sample size allowed for a conservative 20% attrition rate, since the average attrition for behavioral intervention studies can be 17% to 18% (Crutzen, Viechtbauer, Spigt, & Kotz, 2015). Typical pilot sample sizes for feasibility studies range from 20–40 participants (Hertzog, 2008; Melnyk, Morrison-Beedy, & Moore, 2019). The sample size was increased from 30 to 33 after several additional eligible children were identified by school personnel who thought the intervention would benefit them. Columbus City School district has approximately 50,915 students with 56% being Black, 24% White, 10% Hispanic/Latino (ethnicity mixed in with race), and less than 10% each of two or more races, Asian, American Indian, and Hawaiian (Public Schools Review, 2018). Although 80% qualify for free and reduced meals, all students in the district are offered free meals.

Design and Setting

This pilot study utilized a one-group pretest/posttest design with a 6-week postintervention follow-up assessment that was delivered in three urban schools in Ohio. Baseline and immediate postintervention results are described in this article, as the 6-week postintervention data were not available for analysis at the time of this writing. The pilot study was approved by the Institutional Review Board of The Ohio State University and the Research Proposal Review Committee of Columbus City Schools. Potential participating schools were identified by the Director of Health Services of the school district. School selection was based on the individual school administrator's previous receptivity to allowing supplemental programs in the school. We included other schools after school nurses indicated interest, following a professional development day presentation by the interventionist.

The COPE for Asthma in-school intervention sessions were scheduled to occur once each week for seven weeks, and were implemented during lunch. Sessions were referred to as "lunch bunch" group meetings. Small groups of five students or fewer were separated by lunch periods and age groups: 2nd and 3rd graders were in the earlier/first lunch, while the 4th through 6th graders were in the second lunch period. Each session was designed to fill a 30-min period. "Lunch Bunch" tags were provided for participants, so they would not have to wait in the lunch line and could quickly obtain their lunch and walk to the private intervention room. We gave each child a COPE for Asthma manual, which was kept at the school during the implementation period. As the interventionist read through each session's lesson, the children followed along in their own manual and used it as a workbook, writing in or drawing answers to questions. The children answered four or five questions (on paper) at the end of each session to assess comprehension of the material. The interventionist gave

a copy of the weekly practice sheets and weekly caregiver (CG) information for each child to take home. Table 1 highlights the outline of session activities.

Recruitment and Enrollment

Recruitment, enrollment, and screening were completed from October through December 2017. Data were collected between December 2017 and March, 2018. Figure 4 illustrates the CONSORT flow diagram. CGs of children from nonparticipating schools who had returned the contact form but could not participate due to enrollment limit were offered the COPE for Asthma workbook.

Children were recruited from elementary schools in Columbus, Ohio. School nurses in each school gave an information sheet about the study to children with a previous diagnosis of asthma on file; the children were advised to give the sheet to their CGs. Caregivers were only contacted if the information had been signed and returned. The interventionist provided incentives to CGs (i.e., gift cards) and children (e.g., mechanical pencils and \$5–\$10 small gift incentives) for survey participation at each of the three time points (i.e., baseline, immediate postintervention, and 6-weeks postintervention). The interventionist also gave each participating school health clinic a \$75 gift card for their time spent on study activities, such as identifying children with asthma and completing follow-up phone calls to confirm receipt of the information sheet.

Children were eligible if (a) they were between 8 and 12 years of age and enrolled in a participating school, (b) had a diagnosis of persistent asthma and a previous prescription of an asthma controller medication (i.e., CG report or medical condition report on file at the school), (c) they had elevated scores on at least one factor of the anxiety measure (SCARED) or depression measure (PROMIS pediatric short form), (d) they had written consent to participate from their CG and provided assent for themselves, (e) the participating CG had at least equal responsibility for the day-to-day management of the child's asthma, (f) the CGs provided written consent for their own participation, and (g) the child and CG were fluent in English. Exclusion criteria were (a) child had other significant pulmonary conditions (e.g., pulmonary fibrosis, cystic fibrosis), (b) child was currently receiving treatment from a mental health professional, or (c) child or CG had a cognitive learning limitation that interfered with the ability to comprehend the survey questions.

Intervention and Adaptation

The manualized intervention, COPE for Asthma, was adapted from the COPE for school-age children program that was originally developed for adolescents by Bernadette Melnyk (Melnyk, Jacobson, et al., 2013). COPE is a seven-session, CBSB intervention for children and adolescents with anxiety and depressive symptoms. The COPE program has been implemented successfully in 30-min sessions individually in the outpatient clinical setting for children, and in both classroom and small group settings in 45-min sessions (Hickman, Jacobson, & Melnyk, 2015; Hoying & Melnyk, 2016; Hoying, Melnyk, & Arcoleo, 2016; Jacobson & Melnyk, 2012; Kozłowski, Lusk, & Melnyk, 2015; Lusk & Melnyk, 2011). A variety of adaptations of the COPE program have been implemented with ethnically and racially diverse children, adolescents, and young adults (Hart Abney, Lusk, Hovermale, &

Melnyk, 2019; Hoying et al., 2016; Melnyk, Kelly, et al., 2013). Previous short- and long-term outcomes achieved from COPE, up to one year following the intervention, include (a) decreased anxiety, depression, anger, disruptive behaviors, and alcohol use; (b) increased self-efficacy and self-concept; (c) increased knowledge and participation in healthy lifestyle behaviors; (d) improved academic competence and grades; and (e) decreased body mass index (Melnyk, Jacobson, et al., 2013). Interventionists for the COPE program have included school teachers (Melnyk, Jacobson, et al., 2013), nurse practitioners (Lusk & Melnyk, 2011), nurses (Hoying et al., 2016), and doctoral students (Kozlowski et al., 2015). All interventionists for the COPE studies completed a 6-hr training session that covers cognitive theory underpinnings, implementation of a manualized program, and specific CBSB activities in the manual. The interventionist for this study practiced as a school nurse for 12 years and is a doctoral student (first author).

COPE for Asthma was adapted for children with asthma by the interventionist, in collaboration with an asthma expert (Kimberly Arcoleo), to be delivered in a group format. Guided by the National Guidelines for the Diagnosis and Management of Asthma (National Heart, Lung, and Blood Institute, 2007), the following asthma educational components were added: identification of asthma triggers, symptom recognition and the overlap with anxiety symptoms, differentiating controller versus quick relief medications used for asthma, the role and importance of asthma controller medications, proper asthma medication spacer use, diaphragmatic breathing, and the benefits of exercise. The information was framed to support children's asthma self-management and to recognize when to reach out for help.

To make the manual more appropriate for children from ethnically and racially diverse backgrounds, we also changed many of the photos and asthma-related scenarios. After the adaptations were completed, five teachers in the school district reviewed the content for readability for 8- to 12-year old children and subsequent revisions were made. Table 2 provides an overview of the final weekly session content.

Measures Completed by the Child Participants

Screen for Child Anxiety Related Emotional Disorders (SCARED).—The SCARED assesses five anxiety factors including panic/somatic, general anxiety disorder, separation anxiety, social phobia, and school avoidance. It has been validated with children and adolescents ages 8 to 19 years (Birmaher et al., 1999; Hale, Crocetti, Raaijmakers, & Meeus, 2011). Items are scored on a 3-point Likert-type scale from 0 (*not true* or *hardly ever true*) to 2 (*very true* or *often true*; Birmaher et al., 1999). Higher scores indicate greater anxiety, with a total score of 25 as having a potential anxiety disorder and 30 as more specific for having an anxiety disorder (Cronbach's $\alpha = .70-.90$; Birmaher et al., 1999).

Patient Reported Outcomes Measurement Information System (PROMIS) Short Form for Depressive Symptoms.—The Pediatric PROMIS-SF assesses negative mood (e.g., sadness), decrease in positive affect (e.g., loss of interest), negative views of self (e.g., worthlessness), and negative social cognition (e.g., loneliness, interpersonal alienation; Assessment Center, n.d.). Items are scored on a 5-point Likert-type scale from 0 (*never*) to 4 (*almost always*), with higher scores indicating greater depressive symptoms. This instrument

has been validated with children between the ages of 8 to 17 years of age ($\alpha = .85$; Assessment Center, n.d.).

Child Asthma Management Self-Efficacy (CASE).—The CASE scale (14 items) is a 5-point Likert-type scale that measures children's perception of their own ability to manage asthma (e.g., “can tell when a serious breathing problem can be controlled at home”). It also assesses asthma symptoms, health status, and impact of the child's illness on the family (Bursch, Schwankovsky, Gilbert, & Zeiger, 1999). Items are scored from 1 (*not sure at all*) to 5 (*completely sure*). Higher scores indicate greater self-efficacy. This measure has been validated in children ages 7 to 15 years of age and has demonstrated acceptable reliability (Cronbach's $\alpha = .87$; Bursch et al., 1999).

Personal Beliefs Scale—Child Version (PBS-C).—The PBS-C is a 10-item Likert-type scale with items scored from 1 (*strongly disagree*) to 5 (*strongly agree*) and assesses personal beliefs and confidence about managing stress (Jacobson & Melnyk, 2012). Higher scores indicate greater beliefs ($\alpha = .85$). This scale has been used with children and youth between the ages of 9 to 18 years of age and has demonstrated acceptable reliability (Cronbach's $\alpha = .85$; Jacobson & Melnyk, 2012; Melnyk, Kelly, et al., 2013).

Childhood Asthma Symptom Checklist (CASCL).—The CASCL is a 20-item measure of asthma symptom interpretation and assesses the frequency that children experience physical symptoms, irritability, and panic/fear during asthma attacks. Items are scored on a 4-point scale from 1 (*never*) to 4 (*always*). In addition to the three subscales, the instrument yields a total symptom score. The CASCL has been validated for children 6 to 18 years of age and has demonstrated good reliability (Cronbach's $\alpha = .81$; Fritz & Overholser, 1989).

Asthma Illness Representation Scale—Child Version (AIRS-C).—The 17-item AIRS-C was adapted from the validated CG instrument (Sidora-Arcoleo, Feldman, Serebrisky, & Spray, 2010) and designed to identify barriers and risk factors for under-utilization of controller medications. A validation study is currently underway among an ethnically diverse sample of children ranging in age from 6 to 17 years. Items are scored on a 5-point Likert-type scale from 1 (*strongly agree*) to 5 (*strongly disagree*). The instrument yields a total score and subscales for the nature of the disease, facts about asthma, attitudes toward medication use, and treatment expectations. Higher scores indicate closer alignment with the professional model for asthma management (e.g., that asthma is a chronic condition which is readily regulated with daily controller medication use).

Pediatric Asthma Quality of Life Questionnaire (PAQLQ).—The PAQLQ measures functional problems (e.g., symptoms, activity limitations, emotional function) that are troublesome to children with asthma (Juniper, Guyatt, Ferrie, & Griffith, 1993). This 14-item Likert-type scale has been validated for children between ages 7 and 17 years of age (Juniper et al., 1993). Items are scored from 1 (*extremely bothered*) to 7 (*not bothered at all*), and the total score is the mean of items. Higher scores denote better quality of life.

Childhood Asthma Control Test (C-ACT).—The C-ACT consists of questions for children (ages 4–11 years; 4 items) and parents (3 items; see next section). This instrument assesses interference with activities, asthma symptoms, and nighttime awakenings; higher scores indicated better asthma control. The C-ACT (Cronbach's $\alpha = .79$) exhibited good reliability and validity, and classifies adolescents as poorly controlled or well controlled (Liu et al., 2007, 2010).

Measures Completed by the Parents/Caregivers

Demographics collected were age, gender, ethnicity, race, and socioeconomic status (SES; i.e., receiving public assistance). CGs were asked questions related to their child's asthma symptoms and controller medication adherence (13 questions), questions about their child's asthma control (3 questions for the C-ACT), and program evaluation questions.

Caregivers were also asked to complete the Pediatric Symptom Checklist (PSC) at each time point. The PSC is a brief screening questionnaire designed to facilitate the recognition of cognitive, emotional, and behavioral problems in children (J. M. Murphy et al., 2016). The PSC consists of 17 questions such as “My child feels sad, unhappy”; “My child worries a lot”; “My child fights with other children” ($\alpha = .89$; J. M. Murphy et al., 2016). Responses are scored 0 (*never*), 1 (*sometimes*), or 2 (*often*), which were summed to create a total score with higher scores reflective of greater psychological impairment.

Human Protections

Per the IRB-approved intervention protocol, children who scored ≥ 30 on the SCARED measure or had a t -score > 70 on the PROMIS-SF Depression measure were immediately referred by the interventionist to the school nurse, social worker, guidance counselor, or school psychologist for follow-up attention. The study team also sent a referral letter in a sealed envelope with the child addressed to the CG. This same procedure was followed if a child expressed thoughts or had a history of self-harm. The study protocol also specified that the interventionist was required to make a referral to the county child protective services if a concern about abuse, neglect, or dependency was evident.

Data Analysis

Feasibility of the COPE for Asthma program was evaluated by session attendance (e.g., five of the seven sessions by 80% of the participants). Acceptability was achieved if 80% participants responded positively to the five program evaluation questions and completed 80% of the practice/practice sheets (or verbalized examples of practicing skills). Evaluation of the preliminary efficacy of the COPE for Asthma program on anxiety and depressive symptoms, asthma management self-efficacy, symptom interpretation, asthma IRs, controller medication adherence, asthma-related QOL, health care utilization, and asthma control was assessed by paired t tests. All t tests were specified as two-tailed. Tests of significance were set at $p < .10$ instead of $p < .05$ due to the small sample size and risk of Type II error (Polit, 2010; Wasserstein & Lazar, 2016). Effect sizes also were computed using Cohen's d (Statistics Calculator Index, 2018). Effect size measurements are small ($d = 0.20$), medium ($d = 0.50$), and large ($d = 0.80$; Cohen, 1988, p. 40). The Statistical Package for the Social Science (SPSS; IBM Corp., released 2016) was used for all analyses.

Results

Of the 69 information forms sent with follow-up phone confirmation of receipt, 48 CGs returned the consent for contact forms (70% response rate). Fifteen screened out of the study, resulting in 33 participants. Thirty-three children and their CGs were consented, assented, and enrolled. Thirty-two children participated in the intervention, as one family moved to another city prior to implementation of the intervention. Thirty-three children were included in the baseline demographic analyses and 32 children were included in the analyses for intervention effects, session attendance, session evaluation questions, and home practice evaluations. Figure 2 presents the flow diagram for participants in the study.

Demographics

The majority of child participants were male ($n = 24$; 72.7%), African American/Black ($n = 22$; 66.7%), and had a mean age of 9.42 years ($SD = 1.42$). Caregivers were primarily mothers ($n = 26$; 78.8%), with an average age of 37 years (range = 27 to 57 years; $SD = 8.58$). Approximately 64% ($n = 21$) of CGs stated they receive public assistance.

Feasibility and Acceptability

Thirty participants (94%) attended at least five of the seven sessions, demonstrating feasibility of the COPE for Asthma program. The weighted weekly session attendance average was 91%. Two students missed three sessions each. The content for any missed session was made up during a different day or time with each student.

Although acceptability of the COPE for Asthma program was not achieved for the out-of-session practice sheets (weighted average was 62%), the program evaluation questions indicated COPE for Asthma was highly acceptable.

Four program evaluation questions were included at posttest for the child participants. Resulting themes for the question “What did you like best about COPE for Asthma” included asthma education (12 comments), learning how to handle feelings/stay calm (specific to cognitive-behavioral skills; 12 comments), general “I liked the lessons” (7 comments), and specific positive comments about the interventionist and/or feeling safe in the group (4 comments).

The second program evaluation question was “What did you learn from COPE for Asthma?” Five themes were established: How to manage asthma (when/which inhaler to use/general management; 18 comments), how to stay calm/calm during a breathing problem to help my asthma (11 comments), the need to take asthma seriously/do not ignore asthma symptoms (2 comments), seeing others like me (2 comments), and general “I liked it” (2 comments).

The third and fourth program evaluation questions yielded similar themes. We asked, “What did you not like about COPE for Asthma?” and “what would you change about COPE for Asthma?” Five shared themes were established: “Nothing” or left blank (45 comments), felt the program was not long enough (3 comments), liked everything (5 comments), didn’t like having to interact/talk with others (2 comments), and would like (the interventionist) to provide inhalers (2 comments).

In reviewing the child participant comments, 4 out of 127 could be classified as related to a group dynamic (e.g., not wanting to interact/talk with others, some of the questions were hard, and “someone talked about my eating”) or provision of health care, which was beyond the scope of this project (e.g., would like to be given inhalers). The program evaluation comments were overwhelmingly positive (97%), indicating acceptability of the COPE for Asthma program. Examples of comments considered positive included “I loved it because we learned more about asthma” and “I liked the deep breathing because it helped me relax.” Comments such as “I learned how to control my asthma and anger” and “I learned how to control my body” were coded as positive comments.

Preliminary Effects

Table 3 presents the results of the paired *t* tests. Children who participated in COPE for Asthma reported a significant decrease in the separation anxiety factor of the SCARED ($t = 2.00$; $df = 31$; $p = .054$) with a small to moderate positive effect (Cohen's $d = 0.41$). A small to medium positive effect was observed for the decrease in social anxiety, although this did not reach statistical significance, $t = 1.49$, $df = 31$, $p = .15$. Also, significant improvements were made on the PBS-C ($t = -2.01$; $df = 31$; $p \text{ value} = .053$) with a small to moderate positive effect (Cohen's $d = 0.36$), C-ASE ($t = -2.864$; $df = 31$; $p = .007$) with a small to moderate positive effect (Cohen's $d = 0.46$), AIRS-C ($t = -2.86$; $df = 31$; $p = .007$) with a medium positive effect (Cohen's $d = 0.60$), and the parent-reported PSC ($t = 1.93$; $df = 31$; $p = .063$) with a small positive effect (Cohen's $d = 0.22$). The PAQLQ achieved a small effect size (Cohen's $d = 0.26$), although this did not reach statistical significance ($t = 1.55$; $df = 31$; $p = .13$). No clinically or statistically significant differences were observed for children's depression scores or asthma control.

An exploratory subgroup analysis on the 12 children who scored high (≥ 30 on the SCARED measure) on anxiety at baseline (see Table 4) was conducted to determine the impact of the intervention for this highest risk group. Statistically significant reductions occurred in separation anxiety ($t = 3.11$; $df = 10$; $p = .01$) with a large positive effect for the intervention (Cohen's $d = 1.31$) and social anxiety ($t = 2.33$; $df = 10$; $p = .04$), also with a large positive effect (Cohen's $d = 0.93$). Significant improvements also were made on the PBS-C ($t = -2.03$; $df = 31$; $p = .069$) with a medium positive effect (Cohen's $d = 0.57$), AIRS-C ($t = -4.66$; $df = 10$; $p = .001$) with a large positive effect (Cohen's $d = 1.46$), and the parent-reported PSC ($t = 1.79$; $df = 10$; $p = .104$) with a medium positive effect (Cohen's $d = 0.53$). Moderately large positive effects for the intervention also were noted in the total SCARED score (Cohen's $d = 0.72$) and general anxiety (Cohen's $d = 0.60$), although these findings did not reach statistical significance. A comparison of the effect sizes for the whole sample with the high-risk subsample revealed that, for all but three outcomes (PROMIS Pediatric SF-Depression, CASE and C-ACT), the effects of the intervention were stronger among this high-risk group.

Although the study's sample size did not meet the recommended 10 cases per item (Kline, 2015; Polit, 2010) for reliability analyses, Cronbach's alpha measurements at baseline for the measures were examined. The internal consistency reliabilities for the measures were as follows: SCARED ($\alpha = .91$), PROMIS Depression Pediatric SF ($\alpha = .63$), PBS-C ($\alpha = .63$),

CASE ($\alpha = .80$), PAQLQ ($\alpha = .81$), CASCL ($\alpha = .88$), AIRS-C ($\alpha = .48$), C-ACT ($\alpha = .32$), and the PSC ($\alpha = .86$).

Program Fidelity and Adherence

Intervention fidelity is key for evaluation of treatment effects. COPE for Asthma is a manualized program that contributes to consistency of intervention administration. The interventionist completed a 6-hr training on the COPE program and intervention delivery. The fidelity checklist used for COPE for Asthma was adapted from a checklist used in previous COPE studies (Hickman et al., 2015). An independent observer evaluated interventionist fidelity over four sessions utilizing a fidelity checklist that included yes/no items such as “psycho-education covered” and “asthma content covered.” The average fidelity rating was 95%, even though the interventionist made changes during sessions to accommodate student needs on several occasions (e.g., two sessions were split between two weeks instead of one for several groups).

Adverse Events

The interventionist referred 12 children due to high anxiety symptoms (i.e., 30 on the SCARED measure) at baseline. Twelve children also scored high at the posttest mark, although six of them were new (i.e., different than at baseline). The interventionist also referred one student after a session when he verbalized past thoughts of self-harm. Another student was referred to the school counselor after drawing himself with a gun during the goal-setting session, stating his “goal” was to become a “robber.” No child scored moderate or high on the depression measure at baseline. Although school staff contacted the CGs of referred children and recommended mental health evaluation and treatment, a risk-assessment follow-up with a health care provider was completed for only one child. Two other children were placed on a three-to six-month waiting list for a therapist. The school clinical staff reported no further follow-up on their part (interventionist checked in with each of the schools). The data for all the referred children was included.

Discussion and Implications for Practice

COPE for Asthma is a novel intervention designed to support high-risk students with asthma and comorbid anxiety. The results of this study indicated that COPE for Asthma was highly feasible in the school setting and that a small group intervention during the school day was workable for the students. The participants expressed excitement about getting together for the groups and asked if they could have extra groups on different days. Despite having only 20 to 30 min per week for seven to nine weeks in a small group setting, the participants were all able to benefit from COPE for Asthma, especially the subgroup of children who initially reported overall high anxiety symptoms (i.e., 30) on the SCARED instrument. The children’s evaluation of the COPE for Asthma program indicated high acceptability with the exception of the out-of-session practice sheets. Future studies should explore alternative methods for completing the practice sheets, such as online or on a smartphone.

We discovered during program implementation that adaptations needed to be made because for several sessions (i.e., sessions one and two), children had a particularly difficult time

grasping the content and comprehending the information. In addition, during the intervention period, the Parkland school shooting occurred and there were several instances of school lockdowns (The Washington Post, 2018). While the children did not mention the school shooting as a cause of anxiety, it could have affected their level of anxiety.

As a result of this pilot study, we demonstrated that the COPE for Asthma program may be a promising strategy for addressing comorbid asthma and anxiety. For the entire group of children, and especially those who entered the study with overall high anxiety symptoms (i.e., total score ≥ 30 on the SCARED measure), meaningful reductions in separation and social anxiety and increases in personal beliefs, asthma management self-efficacy, asthma-related quality of life, and IRs were found. A significant and medium effect size occurred for asthma IRs, indicating that the children have a more accurate understanding of asthma as a chronic condition instead of episodic (e.g., like a cold virus). The results also showed that the children had a better understanding of the rationale for taking their asthma medications and how important it is to not ignore asthma symptoms. Some of the children verbally commented that they thought “coughing was normal if you have asthma,” when in reality, chronic coughing may be a sign of poorly controlled asthma. These results suggest that the children gained more confidence and developed more internal resources in managing their asthma symptoms and anxiety.

COPE for Asthma may be especially helpful for the group of students scoring high overall on the anxiety (SCARED) measure at baseline. The subgroup analyses revealed that the magnitude of positive benefit of the intervention was greatest for these high-risk children. This is consistent with prior studies using the COPE intervention (Hoying et al., 2016; Melnyk, Jacobson, et al., 2013). With the greater reductions in anxiety, stronger personal beliefs, and asthma management self-efficacy in combination with IRs more closely aligned with the professional model of asthma management, this group may be able to more fully participate in school and academic activities.

Strengthening physical and mental health is key for all students’ academic success. However, school staff have numerous competing priorities over the course of the school day that can make it difficult to integrate these types of small group interventions on a routine basis. The demands of the school day for staff can be compounded by managing children with chronic conditions. Having a chronic condition creates additional challenges and stressors for children in the school setting. Children with asthma and anxiety tend to misinterpret their asthma symptoms and symptom severity. In doing so, these children may disrupt the classroom by asking for their inhaler when it may not be needed or, alternatively, may engage in disruptive behaviors as a result of heightened anxiety. Given that children with asthma and anxiety have increased morbidity (Feldman et al., 2005), providing tools to reduce anxiety and improve asthma control can contribute to positive life changes for this population. While implementing an intervention for children with asthma and anxiety may require extra time on the front end, taking a proactive approach may actually save time and class interruptions in the long run, and place children in the strongest position to succeed academically.

Weekly school lunch-bunch groups are an optimal way to reach small groups of children with asthma who often feel stigmatized. A group intervention can also help them see that there are other children with the same condition (Stewart et al., 2011). Several students commented about how they liked seeing they were not alone in their daily struggles with their asthma.

The COPE for Asthma program has several strengths. First, it provided a school-based intervention for small groups of children with asthma and anxiety. COPE for Asthma is a brief intervention that can be implemented in the school setting by social workers, guidance counselors, school psychologists, and, in some school districts, school nurses. Second, the program is theory based and manualized. The manualized intervention was well received by participants, and many did not want the lunch-bunch groups to end. Significant reductions in anxiety and improvements in personal beliefs/asthma management self-efficacy, and asthma IRs were found despite the small sample size. The results indicated that the participants not only felt calmer and more confident about being able to manage their asthma, they also had a more accurate understanding of asthma. Specifically, they better understood that asthma is a chronic condition, the rationale for taking their controller and quick-relief medications, and the importance of asthma control. It has been reported that by age 11 years, 50% of children are left to manage their asthma medications (Orrell-Valente, Jarlsberg, Hill, & Cabana, 2008). Because of this, educating children about asthma is imperative so they can more accurately interpret their symptoms and treat themselves for optimal health, particularly since it is a lifelong condition. Additionally, the death rate from asthma increases with age (S. L. Murphy, Xu, Kochanek, Curtin, & Arias, 2017), and as the children from this study approach adolescence, they may better understand how and when to take action if symptomatic, and to not ignore asthma symptoms. The knowledge and confidence to act could help them avoid a potentially lethal situation.

Along with the strengths, the limitations of this study must be considered when interpreting the results. The small sample size and one-group design limit causal inference due to threats to internal validity (Melnik et al., 2019; Shadish, Cook, & Campbell, 2002). A small sample size can cause increased variability and limit the ability to detect statistical significance in data (Cohen, 1988; Polit, 2010). Because of this, we set the p value at .10 instead of the usual .05 (Wasserstein & Lazar, 2016). Effect sizes for the results that did not reach statistical significance were discussed because this measure of the magnitude of change provided important information about the intervention's effects regardless of sample size. (Melnik et al., 2019). It is quite possible that the trends for the results with small to moderate effect sizes could reach statistical significance with a larger sample size. Finally, the findings for the C-ACT and AIRS-C may not be reliable, given the results of the Cronbach alphas. Clinical significance should also be corroborated with teacher observations and objective asthma lung function measures in future studies.

Future studies should consider adding an appropriate comparative group to strengthen internal validity. Lastly, generalizability was limited due to the geographic location and the homogeneity of the sample (i.e., primarily male African American/Black children). Replicating this study in larger, more diverse samples in different geographic regions will provide additional evidence about the efficacy of the COPE for Asthma program.

Interventions for children with comorbid asthma and anxiety are needed to improve the mental health and self-management skills of this vulnerable population. COPE for Asthma has demonstrated promise as an effective strategy for children with asthma and anxiety. Teaching skills to reduce anxiety and improve asthma self-management could change the health and academic trajectories of this population and ameliorate the risk of more serious complications downstream.

Acknowledgments

Manuscript preparation by Colleen Marie McGovern was supported by a Ruth L. Kirschstein National Research Service Award (T32NR014225). The content is based solely on the perspectives of the authors and does not necessarily represent the official views of the National Institutes of Health. Funding for the study was provided by The American Nurses Foundation, the National Association of Pediatric Nurse Practitioners Foundation, the National Association of School Nurses, the Midwest Nursing Research Society/Sigma Theta Tau International Foundation for Nursing, and Sigma Theta Tau International—Epsilon Chapter. Bernadette Melnyk has a company, COPE2THRIVE, that disseminates the COPE program. Colleen Marie McGovern has no financial interests or potential conflicts of interest. Kimberly Arcoleo has no financial interests or potential conflicts of interest. This study is registered at www.clinicaltrials.gov/NCT03481673.

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Impact and Implications

Children with asthma and anxiety are at risk of suboptimal health and academic outcomes. Small group interventions are a viable option to implement during the school day. COPE for Asthma strengthened self-efficacy and asthma illness representations congruent with the professional model, resulting in a reduction in anxiety and caregiver-reported symptoms. With further testing, COPE for Asthma could fill a gap in the needs for this high-risk population of children.

Figure 1.
Common model of illness representation (Leventhal, Diefenbach, & Leventhal 1992).

Figure 2.
Cognitive Theory Model (Beck, 2011).

Figure 3.

Adaption of Common Sense Model integrated with cognitive theory for children with asthma. Solid lines indicate established associations. Dotted lines indicate proposed mediators.

CONSORT
TRANSPARENT REPORTING of TRIALS
CONSORT 2010 Flow Diagram

Figure 4.
CONSORT flow diagram for COPE for Asthma participants.

Table 1

Outline of Weekly Session Activities

1	Students arrived with their lunches; interventionist provided bottles of water, juice, and nutritious snacks in line with federal guidelines
2	Review of group ground rules
3	Review of previous week's lesson and practice sheet
4	Review of the thinking, feeling, and behavior triangle
5	Statement of objectives for the session
6	Complete the session using the manual
7	Review of the practice sheet for the week
8	Completion of review questions
9	Dismiss group for class or recess

Table 2

Intervention Curriculum of COPE for Asthma

Session	Session focus COPE for asthma
1	Thinking, feeling, and behaving: What is the connection?/ Asthma triggers
2	Positive thinking and forming healthy thinking habits/ Controller medication
3	Coping with stress and asthma/Symptom perception
4	Problem solving and setting goals/Diaphragmatic breathing; daily controller medication use
5	Working with your emotions in healthy ways through positive thinking and effective communication/Diaphragmatic breathing
6	Coping with stressful situations and asthma triggers/Taking action
7	Pulling it all together for a healthy you; Benefits of exercise with asthma

Table 3

Paired Samples Test for All Participant (N = 32)

Measure	Mean (SD)	Std. error mean	90% Confidence interval of the difference		t	Cohen's d	p (2-tailed)
			Lower	Upper			
Total SCARED	1.44 (14.54)	2.57	-2.92	5.80	.56	.11	.580
Panic	-.56 (4.86)	.86	-2.02	.89	-.66	.13	.517
• General anxiety	.56 (3.81)	.67	-.58	1.70	.84	.18	.410
• Separation anxiety	1.38 (3.89)	.69	.21	2.54	2.00	.41	.054
• Social anxiety	.91 (3.44)	.61	-.13	1.94	1.49	.30	.146
• School avoidant	-.22 (2.11)	.37	-.85	.41	-.59	.12	.561
PROMIS pediatric depression short Form	-.47 (6.70)	1.19	-2.48	1.54	-.40	.09	.695
Personal Beliefs Scale (PBS-C)	-1.66 (4.66)	.82	-3.05	-.26	-2.01	.36	.053
Child Asthma Management Self-Efficacy (CASE)	-4.31 (8.51)	1.51	-6.87	-1.76	-2.86	.46	.007
Child Asthma Symptom Checklist (CASCL)	-.47 (14.52)	2.57	-4.82	3.88	-.18	.03	.856
Pediatric Asthma Quality of Life (PAQLQ)	3.75 (13.70)	2.42	-.36	7.86	1.55	.26	.132
Asthma Control Test (C-ACT)	.16 (2.30)	.41	-.53	.85	.38	.07	.704
Asthma Illness Representations (AIRS-C)	-3.38 (6.66)	1.18	-5.37	-1.38	-2.87	.60	.007
Pediatric Symptom Checklist (PSC; Parent report)	1.34 (3.95)	.70	.16	2.53	1.93	.22	.063

Note. Bold font indicates statistical significance at the .10 level.

Table 4
Subgroup Analysis for Children Who Scored High 30 on the Anxiety SCARED Measure (N = 11)

Paired differences							
Outcome measure	Mean (<i>SD</i>)	Std. error mean	90% Confidence interval of the difference		<i>t</i>	Cohen's <i>d</i>	<i>p</i> (2-tailed)
			Lower	Upper			
Total SCARED	8.91 (17.49)	5.27	-.65	18.47	1.69	.72	.122
Panic	1.46 (6.33)	1.91	-2.01	4.91	.76	.28	.464
• General anxiety	1.91 (4.44)	1.34	-.52	4.33	1.43	.60	.184
• Separation anxiety	3.82 (4.07)	1.23	1.59	6.04	3.11	1.31	.011
• Social anxiety	2.73 (3.88)	1.17	.61	4.85	2.33	.93	.042
• School avoidant	-.73 (2.94)	.89	-2.33	.88	-.82	.31	.430
PROMIS pediatric depression short form	-.46 (8.96)	2.70	-5.35	4.44	-.17	.06	.870
Personal Beliefs Scale (PBS-C)	-2.36 (3.85)	1.16	-4.47	-.26	-2.03	.57	.069
Child Asthma Management Self-Efficacy (CASE)	-3.82 (9.25)	2.79	-8.87	1.24	-1.37	.42	.201
Child Asthma Symptom Checklist (CASCL)	5.64 (11.53)	3.48	-.66	11.94	1.62	.37	.136
Pediatric Asthma Quality of Life (PAQLQ)	6.09 (18.00)	5.42	-3.7	15.91	1.12	.38	.287
Asthma Control Test (C-ACT)	-.09 (2.12)	.64	-1.25	1.07	-.14	.04	.890
Asthma Illness Representations (AIRS-C)	-7.27 (5.18)	1.56	-10.10	-4.44	-4.66	1.46	.001
Pediatric Symptom Checklist (PSC; Parent report)	2.36 (4.39)	1.32	-.03	4.76	1.79	.53	.104

Note. Bold values are define significant at the .10 level.