

SPECIAL POPULATIONS

Effects of Coping-Skills Training in Low-Income Urban African-American Adolescents with Asthma

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Background. Minority teens with asthma are at particular risk for this life-threatening disease due to increased morbidity and mortality rates in addition to the normal challenges of adolescence. **Objective.** The purpose of this randomized controlled trial ($n = 137$) was to determine the effects of a coping-skills training program (intervention) compared with standard asthma education (attention control) in African-American teens with asthma. **Methods.** Adolescents were recruited from five African-American dominant high schools serving low-income areas of Chicago. Data were collected at baseline, 2 months (immediately following the intervention), 6 months, and 12 months. **Results.** Both groups improved over time, with significant increases in asthma-related quality of life, asthma knowledge, and asthma self-efficacy, accompanied by decreases in symptom days and asthma-related school absences. **Conclusions.** Findings suggest that coping-skills training as implemented in this study provided no additional benefit beyond that experienced in the control group. However, group-based interventions delivered in the school setting may be beneficial for low-income, minority teens with asthma.

Keywords asthma control, minority health, school-based health, self-care, teen

INTRODUCTION

Regardless of race or ethnicity, asthma is the most prevalent chronic illness in childhood, affecting 7 million youth under the age of 17 years (1). Of particular concern is asthma morbidity among minority children and youth living in poverty. The prevalence rate of asthma is 22% higher in African-Americans than in Caucasians (1). Furthermore, hospitalization and death rates of African-Americans are nearly triple compared with those of Caucasians (2). The prevalence of asthma in Hispanic groups, other than Puerto Ricans, is similar to that in non-Hispanic whites (3). Asthma is the leading cause of school absences, accounting for 14 million lost school days, and is estimated to incur health care and lost productivity costs of \$14.2 billion per year (2). Alterations in daily activities, interruptions in sleep, and the financial burden of this disease directly affect the quality of life and academic success of youth with asthma and their families.

Adolescents with asthma are particularly at risk for poor control of their disease due to the tumultuous changes of adolescence combined with concerns of normalcy, peer approval, and feelings of invincibility. In addition, parental control diminishes as adolescents' transition from parent-managed care to self-care. These factors can lead to a lack of adherence to an asthma management plan. For example, due to peer pressure, teens with asthma may not take their medications, especially prior to a gym class or an athletic

event, as they do not want to be seen as "different." In a focus group study, students stated that they also felt pressure to smoke even though it negatively affected their asthma (4). Such actions can result in ineffective management and a potentially life-threatening asthma exacerbation (5).

The most current National Heart, Lung, and Blood Institute (NHLBI) asthma management guidelines that address adolescent asthma management recommend that non-pharmacologic management of asthma be incorporated into every plan, including the use of peak flow meters to monitor respiratory function, and patient and family education (6). In addition, the Center for Disease Control (CDC) recommends that schools, families, health care providers, and public health practitioners work together to assist high school students in managing their disease by providing health services and education (7).

In the last decade, other supportive interventions, such as cognitive behavior modification strategies, have been found to be successful in treating individuals with chronic illnesses. The literature suggests that interventions that use cognitive behavioral strategies are more effective in supporting change than solely knowledge-based interventions (8–10). One successful program, coping-skills training (CST) (11), based on social cognitive theory, stresses the use of adaptive coping methods and problem-solving skills. These skills can increase a teen's sense of competence and self-efficacy in dealing with a wide range of daily demands and health issues.

Adolescents use a range of both adaptive and maladaptive coping methods. Adaptive coping as described by Lazarus and Folkman (12) includes active problem solving

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such as seeking information, support and other positive ways to address a stressful situation. In this study, adolescents' coping capability was examined as it related to the stressors presented by having the chronic illness asthma. Self-efficacy is defined based on Banudra's definition "... beliefs in one's capabilities to organize and execute the course of action required to produce given attainments" (13). For the purposes of this study, self-efficacy is specific to the knowledge, beliefs, and actions needed to maintain asthma health as well as manage an asthma crisis (14).

In the general child and adolescent population, participation in CST has resulted in a decrease in substance abuse (15); an increase in social skills and reduction of aggressive behavior (16); and a decrease in negative responses to stressors (17).

CST has also been used with children and adolescents with chronic illness. A well-conducted randomized controlled trial (RCT) reported that CST improved HbA1c in adolescents with poorly controlled diabetes and improved general self-efficacy (18). In another RCT (19), CST was compared with general diabetes education in children with type 1 diabetes. Both groups improved over time, reporting lower impact of diabetes, improved coping with diabetes and diabetes self-efficacy, fewer depressive symptoms, and less parental control. The positive outcomes associated with the use of CST were also documented in two smaller studies (20, 21): Children with cancer who participated in a CST program had fewer behavioral problems, increased peer and teacher social support, and a higher level of school competence (20). When children with chronic cardiac conditions participated in a CST program prior to surgery, they demonstrated increased cooperation and better adjustment to home (21). CST was also used in a pilot study to examine the effect of a school-based intervention for teens with asthma. The treatment groups scored significantly higher on self-efficacy, activity-related quality of life, and social support compared with the control groups (22).

Although these studies demonstrated positive results, none of them specifically targeted low-income minority youth. Recently, CST was used in two studies with low-income minority youth: A telephone health-coaching program for minority youth at risk for type 2 diabetes incorporated CST (23). A variety of vignettes illustrated how telephone health coaching reinforced lifestyle changes in students by incorporating CST. CST was also incorporated into a program to prevent type 2 diabetes in high-risk, minority youth (24). The experimental group demonstrated improved glucose and insulin levels and increased dietary knowledge. The use of CST can assist adolescents to negotiate what they need from adults and peers in order to achieve therapeutic goals and more effectively manage their disease. These skills can also be generalized to other life experiences. In addition, low-income minority students with asthma face additional stressors such as violence that can negatively affect their health outcomes. The principal investigator (PI) piloted a CST with minority students with asthma to determine if routine asthma care delivered in conjunction with CST could improve psychosocial and health outcomes for teens with asthma. A

secondary aim was to pilot test the instruments and the intervention for use in the current RCT. Trends in the improvement in asthma self-efficacy and asthma-related quality of life were determined for the treatment group (25).

The current study, implemented by a multi-disciplinary team, provided a comprehensive asthma program to low-income urban African-American teens with asthma. This school-based program was composed of asthma education, CST, and nurse practitioner re-enforcement visits. The PI has an earned PhD and has served as a clinician, educator, and researcher in the area of pediatrics for 30 years. For the last 15 years, her program of research has focused on minority children with asthma. The Co-PI also has an earned PhD and is a licensed clinical psychologist with experience in treating low-income urban adolescents and focuses her research on violence in communities and youth populations.

PURPOSE

The objective of this study was to evaluate the efficacy of a school-based asthma education/management program TEAM (teen educational asthma management) on self-care and quality of life of urban African-American teens with asthma. The TEAM program is composed of three elements: (i) asthma education; (ii) coping-skills training (CST); and (iii) nurse practitioner re-enforcement visits (Figure 1). The following hypotheses were tested:

- (i) African-American adolescents with asthma participating in the TEAM program will show significant improvements in asthma self-care and asthma-related quality of life compared with those receiving standard asthma education (an attention control) at three post-test periods: 2, 6, and 12 months.
- (ii) African-American adolescents with asthma participating in the TEAM program showed significant improvements in asthma knowledge, asthma self-efficacy, coping, and asthma health outcomes as measured by FEV1, FVC, FEV1/FVC, mean peak flow readings (PEFR), number of symptoms days, asthma-related ED visits and hospitalizations, and asthma-related school absences compared with those receiving standard asthma education (an attention control) at three post-test periods: 2, 6, and 12 months.

METHODS

Design and Sample

This randomized, two-arm, controlled trial included students recruited from five African-American dominant high schools serving low-income areas of the south and west sides of Chicago. Teens were eligible to participate if they (1) were between the ages of 13 and 19 years; (2) had intermittent or persistent asthma; (3) had no other significant chronic illnesses, and (4) were enrolled in their

Orem's Self-Care Deficit Theory of Nursing
Study Variables

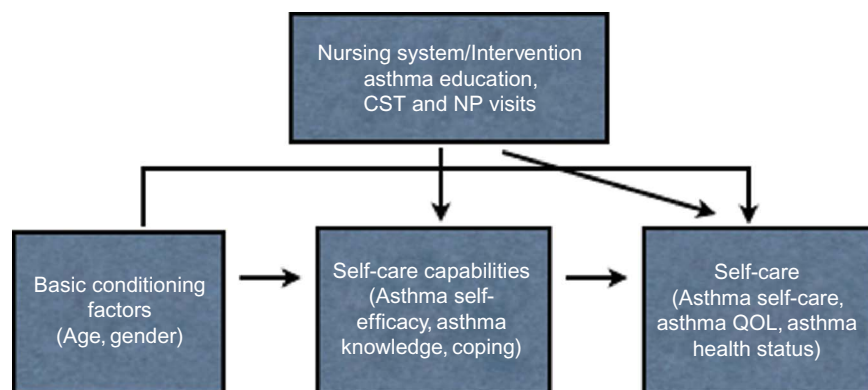


FIGURE 1.—Conceptual framework.

school's health center (SBHC). Participants were excluded if they had other existing chronic illnesses or were participating in another clinical trial. A two-tailed $p < .05$ was set as the level of statistical significance, with general linear models including multiple regression and ANOVA used to assess longitudinal change. Thus, the key to determining target sample size was to estimate the size of the effects we are likely to observe. A power analysis determined a required sample size of 134 to detect modest-sized treatment effects ($R^2 > 0.07$) on rates of longitudinal change in the outcome measures of this study. This sample size reflects a potential attrition rate of 25%, thus yielding a final sample of 100. Initially, 165 students were approached to take part in the study (Figure 2). A total of 28 students were ineligible resulting in the final study sample of $n = 137$. All of the students were low-income African-American teens with asthma. Between 87% and 97% of students and their families received public aid. Randomization occurred by school since individual randomization within schools could lead to contamination. The research staff were not masked to participant group assignment.

Setting and Procedures

Recruitment. Multiple methods were used to recruit students. Recruitment fliers were posted around the schools, and a TEAM recruitment table was set up during school orientations and report card pickup days. The school-based nurse practitioners (NPs) also identified prospective students with asthma enrolled in the SBHC. A letter summarizing the study and inviting students and their parents/guardians to participate was sent to potential study participants' homes by the SBHC staff. If interested, the student and parent/guardian completed the assent/consent forms approved by the PI's university institutional review board and the Chicago Public School System's Office of Research, Evaluation and Accountability. The parent asthma questionnaire was also completed by the parent/guardian.

Trained research assistants (RAs) collected data at baseline, that is, immediately after the asthma education sessions (attention control), at the 2-month data collection

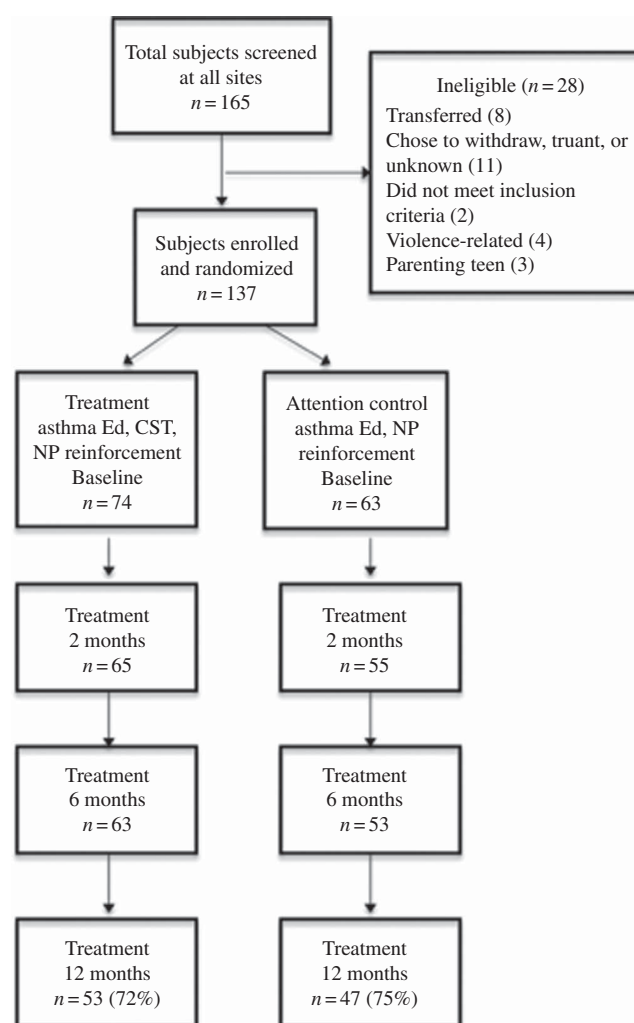


FIGURE 2.—Recruitment and retention flow of subjects.

point (immediately following the intervention), at 6 months, and at 12 months. An NP system exam focused on head, eyes, ears, nose and throat (HEENT), chest, and integumentary was performed with all students at baseline and at 12 months. The TEAM NP was National Institute

for Occupational Safety and Health (NIOSH)-certified to conduct spirometry. In the school setting, baseline spirometry and a 10-day peak flow meter diary were obtained from each participant. Participants were classified as having either intermittent or persistent asthma (e.g., patients who have symptoms more than twice a week during the day or more than twice a month at night) based on the National Heart, Lung and Blood Institute and National Asthma Education and Prevention Program (NAEPP) guidelines (6). To promote continuity of care, the research NP collaborated with the SBHC health care providers in managing the participants' asthma. The stepwise approach to medication therapy was evaluated at baseline, 6 months, and 12 months. All students and their respective SBHC providers were provided with an asthma action plan at baseline, which was updated throughout the study. Components of asthma care included assessment and monitoring, use of a written asthma action plan, and patient education to control or lessen environmental triggers and enhance medication compliance.

Attention Control: Asthma Education. Attention control was given to both groups of students in the form of two asthma education sessions (group format), three education re-enforcement sessions (group format), and one 6-month clinic visit (individual format) with the research NP. The first asthma education session (consisting of two education classes) occurred after baseline data were collected. The second series of asthma education re-enforcement sessions (consisting of three NP-supervised monthly group educational gaming sessions (26), followed by one individualized NP clinic visit) occurred after the intervention was implemented and the first set of post-test data was collected. Content of the sessions included the administration of hydrofluoroalkane (HFA) and the use of a metered-dose inhaler (MDI) in conjunction with a static-free aerochamber. All participants were educated about asthma triggers, warning symptoms, HFA administration, and frequency of MDI use to promote medication adherence. Innovative techniques, such as gaming (26), were utilized to capture the attention of the adolescents and promote group learning.

Intervention: Coping-Skills Training. In addition to the asthma education received in the aforementioned sessions, the intervention participants received CST. CST is a cognitive behavioral strategy, which is a component of the supportive-educative nursing system to be delivered only to the students in the treatment group. The goal of CST is to "teach children and adolescents personal and social coping skills that can assist them in dealing with potential stressors they encounter in their daily lives and the stress reactions that may result from these situations" (11). Five CST sessions were delivered, one per week, during the extended homeroom period for approximately 45 minutes, over a period of 6 weeks, with one makeup session, to make a total of six sessions. The following skills were taught: (1) social problem-solving skills; (2) effective communication and social skills; (3) managing stress; (4) conflict resolution around issues associated with asthma; and (5) cognitive restructuring (guided self-dialogue). Table 1 describes the content covered in each session.

At each session, one of the skills was taught and students were asked to role-play the skill within an asthma-based scenario. The next session began with a review of the skill that was discussed the previous week, and participants were asked if they used the skill and if the skill was helpful. New skills were taught in the same manner each week. The CST leader encouraged constructive and appropriate interactions among the students by establishing a supportive and informal atmosphere. Students responded positively to the CST leader and had positive things to say about the sessions, as indicated in the end-of-the-year interviews. A booster CST session was offered at 2 months after completion of all of the CST sessions. The booster consisted of a review of all the skills taught during the five CST sessions. A doctoral student was trained by the PI to conduct the CST sessions. The training included five two-hour sessions. In addition, each session was audio-taped and reviewed by the PI to ensure quality control and assess intervention fidelity.

Measures

All measures were validated for content and construct validity in minority teens with asthma based on previous

TABLE 1.—Coping skills training description.

Session	Description
1. Introduction and problem solving	Session content, structure, rules, overview of CST, identification of problems, listing of alternative ways of dealing with situations and potential consequences of those alternatives, evaluate alternatives, select alternatives, put plan into action, evaluate progress, begin again if unsuccessful
2. Communication and social skills	Help participants express themselves in ways that are clear, appropriate, and constructive. Review forms of communication (passive, aggressive, and assertive) and communication guidelines for speaking and listening
3. Managing stress	Teaching of a variety of stress management techniques (deep breathing, muscle relaxation, and guided imagery) and exploring the techniques that have been helpful for each student in the past
4. Conflict resolution	Focuses on reassessing conflict situations with the goal of finding a solution with a better outcome. The concept of "win-win" resolution of problems is stressed. The advantages and disadvantages of different conflict management styles (avoidance, giving in, confrontation, being humorous, and problem solving) are discussed
5. Cognitive restructuring	A systematic approach designed to help participants address stressful situations through the recognition of their own thoughts and feelings, problem solving, and guided self-dialogue. Changing negative thoughts into positive thoughts, increasing feelings of self-esteem and self-efficacy, and teaching behavior modification

studies conducted by the authors. All alpha values refer to the present sample.

The Parent Asthma Questionnaire solicits information from parents/guardians related to demographics and the adolescent's prior asthma health status.

Asthma Self-Care. The asthma self-care practice instrument is a 21-item scale designed to measure asthma self-care practices in children and adolescents (27). The metric is a ratio scale of 0–100%, indicating a range of actions performed, with a high ratio indicating actions well-performed. The types of items include “What percentage of the time do you watch yourself for signs of asthma such as wheezing, coughing, or trouble breathing?” and “What percentage of the time do you know when an asthma episode is ‘coming on’ or starting?” A panel of physicians and nursing experts in pediatric asthma established content validity. Total scale alphas were strong ranging from 0.90 to 0.92 across the assessment time periods.

Asthma Quality of Life. The pediatric asthma quality of life questionnaire is a 23-item, seven-point, Likert-scale tool that assesses both physiological and emotional functional impairments experienced by children and adolescents (28). There are three subscales: symptoms experienced (10 items), activity limitation (5 items), and emotional functioning (8 items) in relation to one's asthma. All items are equally weighted. Construct validity showed strong relationships with control of asthma and medication requirements. In addition, significant relationships have been established with generic quality of life questionnaires. Total-scale alphas were strong, ranging from 0.93 to 0.94 across the assessment time points.

Knowledge about Asthma. The asthma knowledge test, a 25-item multiple choice and true/false cognitive test, measures knowledge and self-care abilities specific to asthma. An expert panel rating indicated good content validity among children between 8 and 12 years of age (29, 30). The measure includes items such as, “When you have an asthma episode, what happens inside of your lungs?” and “How does your asthma medicine help you?” The instrument was piloted by the PI in a group of minority teens with asthma, prior to use in the RCT, with reliabilities ranging from 0.79 to 0.83 (31). In the current study, alpha coefficients ranged from 0.61 to 0.80 across the assessment time points.

Asthma Self-Efficacy. The asthma belief scale is a 15-item instrument that measures self-care capabilities related to self-efficacy or beliefs held by an adolescent regarding the level of confidence in managing asthma (32). The construct focuses on one's perceived ability to manage illness based on Bandura's concept of self-efficacy (13, 33). The 15 items are rated on a five-point scale from “I can do this” to “I cannot do this,” with higher scores indicating greater self-efficacy. Examples of statements include “List my asthma triggers” and “Name the asthma medicines I take.” In the current study sample, alpha coefficients ranged from 0.89 to 0.91 at all data collection time points.

Coping-Frequency/Efficacy. Coping was measured using Kid Cope, a 17-item inventory designed to assess 10 cognitive and behavioral coping strategies used by adolescents (e.g., distraction, social withdrawal, cognitive re-structuring, self-criticism, blaming others, problem solving, emotional regulation, wishful thinking, social support, and resignation) (34, 35). To assess frequency, a specific stressor was identified and the adolescent was asked to indicate how frequently she/he used each of the specific coping strategies to cope with the stressor, using a four-point scale ranging from “not at all” to “a lot.” A five-point scale ranging from “not at all” to “very much” was used to examine efficacy of the coping strategy used. Examples of statements in this measure included “I thought about something else; tried to forget it; and/or did something else like watch TV or play a game to get it off my mind” and “I tried to see the good side of things and/or concentrated on something good that could come out of this situation”. Initial studies indicated adequate test/re-test reliability ($r = 0.73$) and moderate to high correlations with other measures of coping. Consistent with previous studies that have found a total scale alpha of 0.83 (28, 29), the alpha coefficient for coping frequency ranged from 0.74 to 0.80 while the alpha coefficient for coping efficacy ranged from 0.73 to 0.86 across the assessment time periods.

Asthma Health Outcomes. Asthma health outcomes were obtained through several methods including spirometry, mean peak flow readings (PEFR), report of the number of symptoms days, report of asthma-related urgent and ED visits and hospitalizations, and recordings in a daily asthma diary. The asthma diary was maintained for a period of 2 weeks at each data collection period. Each individual's PFM reading was adjusted for height and categorized into asthma management zones (red, yellow, green) during clinic visits. If a student's PFM reading was in a zone other than green, she/he was assessed either by the TEAM NP or by the SBHC and administered a bronchodilator if needed. Review of asthma warning signs, asthma triggers, and medication compliance (controller and rescue medication compliance) was also emphasized. In addition, self-reported asthma-related school absences were monitored throughout the year the students were enrolled in the TEAM program. Asthma control was operationally defined according to the NAEPP guidelines (6). For this study, well-controlled asthma was defined as meeting all of the following criteria: mean peak flow reading in the green zone, asthma symptom frequency less than 2 days a week, asthma symptom frequency less than 2 nights per month, and use of asthma rescue medicine less than 2 days a week.

Data Analysis

Initially, frequencies of all variables were examined. Missing data for each questionnaire outcome were imputed at 2, 6, and 12 months using PRELIS software multiple imputations via the expectation-maximization (EM) algorithm. Using the intent-to-treat approach, a series of

mixed-model ANOVAs examining the interaction between treatment and time were used to determine if those in the treatment group exhibited significant improvements over time as compared to the control group. Per-protocol analysis multiple regression models were used to evaluate the efficacy of the intervention classifying only those who completed all CST sessions. For all analyses, two-sided tests were used and a p value $\leq .05$ was considered significant.

RESULTS

Sample Characteristics at Baseline

Baseline scores on asthma self-care, asthma-related quality of life, knowledge about asthma, asthma self-efficacy, coping frequency, and asthma health outcomes did not differ between treatment and control groups. However, asthma coping-efficacy and asthma-related school absences per month did differ between the two groups (Table 2). Self-reported asthma quality of life scores indicated a moderate level of impairment for all students, with only 53% of students determined to be in control of their asthma. Despite efforts to recruit and retain students with more severe asthma, 64% of the study sample was classified as having intermittent asthma.

Hypothesis 1: Treatment Efficacy for Self-Care and Quality of Life

Using an intent-to-treat approach, the two mixed-model ANOVAs indicated no main effect of treatment and no interaction between treatment and time for asthma self-

care and asthma quality of life. Specifically, results indicated no significant differences for asthma self-care and asthma quality of life between treatment and control groups overall, nor at the 2-, 6-, and 12-month post-test periods ($p > .05$, partial h^2 ranging from 0.005 to 0.07 individually). Interestingly, results indicated a significant main effect of time such that asthma quality of life scores improved over time for both groups ($p < .001$, partial $h^2 = 0.05$); this effect was not observed for asthma self-care scores ($p > .05$, partial $h^2 = 0.00$) (Table 2). Per-protocol analysis (those who attended all CST sessions) also revealed similar findings. Taken together, these findings suggest that while treatment and control groups did not differ in their rate of change across time, there was significant improvement in quality of life scores across time overall.

Hypothesis 2: Treatment Efficacy for Knowledge, Coping, Efficacy, and Health Outcomes

As with hypothesis 1, several mixed-model ANOVAs indicated no significant main effect of treatment and no interaction between treatment and time for asthma knowledge, asthma coping-frequency, asthma coping efficacy, and asthma health outcomes. Specifically, results indicated no significant differences for these variables between treatment and control groups overall, nor at the 2-, 6-, and 12-month post-test periods ($p > .05$, partial h^2 ranging from 0.001 to 0.02), individually. However, results did indicate a significant main effect of time such that both groups improved on asthma knowledge ($p < .01$, partial $h^2 = 0.04$), asthma self-efficacy ($p < .001$, partial $h^2 = 0.08$), symptom days, ($p < .001$, partial $h^2 = 0.30$), and asthma-related school absences ($p < .001$, partial $h^2 = 0.04$) over the course of the intervention. Asthma coping frequency, asthma coping efficacy, spirometry, peak flow meter readings, and asthma-related hospital visits did not, however, improve on average ($p > .05$; partial h^2 ranging from 0.005 to 0.01). As with hypothesis 1, per-protocol analysis was used to examine each outcome. Again, these analyses yielded similar results, suggesting that the intervention was not more effective than a control. However, both groups exhibited improvement on several outcomes, indicating some benefit to participants.

DISCUSSION

The objective of the present research was to evaluate the efficacy of a school-based asthma education/management program on psychosocial and health outcomes. Both the treatment and the control groups exhibited improvements over time in asthma-related quality of life, asthma knowledge, asthma self-efficacy, symptom days, and asthma-related school absences, suggesting that the attention received by both groups may have contributed to this effect. Findings of this study indicated that urban African-American teens with asthma reported significant improvements in quality of life over time regardless of group, supporting the value of a psychoeducational group intervention, as reported in prior studies (19).

TABLE 2.—Baseline sociodemographic and health characteristics by group ($n = 137$).

Variable	Treatment ($n = 74$) Mean (SD)	Control ($n = 63$) Mean (SD)	Differences
Age (years)	15.97 (1.41)	15.59 (1.35)	ns
Gender (% female)	71.6%	66.7%	ns
Severity			ns
Intermittent	64.9%	63.5%	
Mild persistent	21.6%	25.4%	
Moderate persistent	10.8%	1.6%	
Severe persistent	0%	1.6%	
Control			ns
Not well-controlled	51.4%	39.7%	
Well-controlled	47.3%	57.1%	
Asthma self-care	57.71 (17.23)	56.47 (19.39)	ns
Asthma-related quality of life	4.35 (1.14)	4.57 (1.01)	ns
Asthma knowledge	18.93 (2.79)	18.44 (3.28)	ns
Asthma coping frequency	1.40 (0.53)	1.56 (0.55)	ns
Asthma coping efficacy	1.66 (0.78)	1.96 (0.82)	$p < .05$
Asthma self-efficacy	3.90 (0.70)	3.80 (0.84)	ns
Peak flow	406.95 (74.61)	422.57 (83.40)	ns
Symptom days	3.63 (5.30)	3.11 (5.34)	ns
Hospital visits/6 months	0.03 (0.16)	0.08 (0.33)	ns
Asthma absences/month	0.34 (1.06)	0.89 (1.83)	$p < .05$

Note: ns, not significant

There were several challenges to recruiting, retaining, and engaging teens in the TEAM program that limited study findings. Multiple attempts were made to recruit students. Although the TEAM program was discussed with coaches and gym teachers who often stated they had student athletes with asthma, few athletes attended the program. In addition, students with persistent asthma were more difficult to recruit, as they often had other issues that kept them out of school, thereby missing the opportunity to be enrolled in the current study. Additional strategies to include students with severe asthma could include recruiting from ERs and other acute-care settings.

To enhance retention and engagement, a number of thoughtful program elements were implemented throughout the study. Invitations, small tokens of appreciation, and innovative techniques (music, gaming) to help convey the program content were introduced. Stepwise compensation and an additional chance to win an iPod at 6 and 12 months in each cohort were built into the program. High mobility rates and competing academic or school-related events often interfered with the routine delivery of the program.

The CST program in this study focused on coping strategies believed to be the most important to successful asthma symptom control. The format of six weekly sessions may have not been long enough to deal with the highly stressed urban low-income youth studied in this project. Frequently, stressors other than asthma were of greater concern to the participants, rendering it difficult to focus on the topic of asthma.

Neighborhood violence was another factor that impacted the implementation of the TEAM program. Researchers have highlighted the difficulty of working in "highly unstable environments" (36). On several occasions, student participants described instances of violence that affected their sense of security. After one specific day of violence, students expressed concern for their well-being and stated "we're not safe anywhere." It was not uncommon for a CST session to begin with a discussion about a recent violent event in the neighborhood.

A limitation of working in a community setting is the threats to external validity; therefore the results must be interpreted with caution. Despite these limitations, several important research and clinical implications can be derived from this study. Attendance at the group asthma education sessions and NP re-enforcement visits demonstrated improvement in psychosocial and asthma health outcomes. In addition, in order to ensure the success of any intervention program, cultural aspects must be considered. Overall, limited data exist on the role of culturally specific interventions with minority participants. A previous meta-analysis determined that cultural context is not normally considered in developing asthma intervention programs (34). Although only four studies were eligible for inclusion in the review, the limited data suggested that culture-specific programs were more effective than generic programs in improving outcomes such as quality of life, asthma knowledge, asthma exacerbations, and asthma

control. However, not all outcomes showed improvement. Recommendations include the need to conduct additional RCTs to address or answer this question (37).

The ethnic and cultural background of participants was one factor that contributed to the complexity of the findings. For example, some participants stated that a particular aspect in one of the CST sessions was not helpful for them. Specifically, in the session on relaxation, teens stated that due to the prevalence of violence in their neighborhood, they did not like to close their eyes to practice the breathing and relaxation exercises; rather they preferred other methods of relaxation such as watching TV, listening to music, playing video games, or playing sports. This suggests that future studies will need to employ communication, coping, and relaxation strategies that are specific to the cultural background of minority teens with asthma. The use of peer leaders and an increase in the use of technology as suggested by our program participants may increase the applicability of the program for participants.

Last, collaborative working with both the schools and the health clinics is necessary for conducting school-based research studies. The TEAM staff worked diligently to maintain constant streams of communication open between the TEAM program and school officials. Simple gestures, such as making small conversation about asthma to any and all interested school personnel, helped to heighten the awareness about the program. Newsletters were also created to update staff and student participants, and fliers were posted around the school.

Due to the dramatic increase in its incidence over the past 15 years, asthma has become a significant public health concern, particularly in minority populations at increased risk for asthma morbidity. Although prior studies have demonstrated the significant impact of asthma education/management programs on the school-aged population, very few programs were specifically targeted to teens. This study sought to address this knowledge gap by implementing a developmentally appropriate school-based program to improve asthma self-care practices, asthma-related quality of life, and health outcomes among urban African-American teens. A combination of asthma education, CST, and NP re-enforcement visits resulted in significant increases in asthma-related quality of life, asthma knowledge, asthma self-efficacy, and a decrease in symptom days and asthma-related school absences for all participants.

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DECLARATION OF INTEREST

The authors report no conflicts of interest.

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