



## Research paper

# Addressing adverse childhood experiences and health risk behaviors among low-income, Black primary care patients: Testing feasibility of a motivation-based intervention



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## ABSTRACT

**Objective:** This pilot study tests the feasibility of implementing a two-session intervention that addresses adverse childhood experiences (ACEs), post-traumatic stress symptoms, and health risk behaviors (HRBs) among Black primary care patients. African Americans are disproportionately exposed to stressful and traumatic events and are at greater risk for PTSD than the general population.

**Method:** A prospective cohort, experimental (pre-post) design with 2 post-intervention assessments were used to evaluate the feasibility of a motivation-based intervention for Black primary care patients with one or more ACEs. Indicators of feasibility implementation outcomes were assessed by participant adherence to treatment; suitability, satisfaction, and acceptability of the intervention; in addition to clinical outcomes of stress, HRBs, and behavioral health referral acceptance.

**Results:** Out of 40 intervention participants, 36 completed the intervention. Of the patients with one or more ACEs who participated in the intervention, 65% reported 4 or more ACEs and 58% had positive PTSD screens, and nearly two-thirds of those had at least one HRB. Satisfaction with the program was high, with 94% of participants endorsing “moderately” or “extremely” satisfied. The sample showed significant post-intervention improvements in stress, alcohol use, risky sex, and nutrition habits. Although stress reduction continued through 2-month follow-up, unhealthy behaviors rebounded. Almost one-third of participants were connected to behavioral health services.

**Conclusions:** Brief motivational treatment for ACEs is feasible in underserved primary care patients and could help individuals develop healthier ways of coping with stress and improve health.

## 1. Introduction

Adverse childhood experiences (ACEs), including abuse, neglect and household dysfunction prior to age 18, contribute to many of the leading causes of morbidity and mortality in the United States [1,2]. Moreover, ACEs are important risk factors for mental health disorders [3,4], including post-traumatic stress disorder (PTSD) [5–7]. The original ACE study demonstrated that ACEs are common and are strongly associated with poor health outcomes later in life [2]. Additional studies have replicated the dose-response relationship between ACE scores and health outcomes [8–12]. Currently, scholars are attempting to

translate findings from ACE research into healthcare practice [13–15].

ACEs are especially prevalent in low-income, minority patient populations [16–18]. African Americans are disproportionately exposed to stressful and traumatic events particularly in urban areas, and the combination of traumatic, racial and socioeconomic stressors contributes to reduced life expectancy [19,20]. Racial and ethnic minority populations that experience significant health disparities are vulnerable to historical traumas [21]. African Americans are particularly susceptible to the intergenerational transmission of trauma through multiple mechanisms including ongoing discrimination and epigenetic inheritance [22]. African Americans are at greater risk for PTSD than the

*Abbreviations:* ACE, adverse childhood experiences; PTSD, post-traumatic stress disorder; HRB, health risk behavior

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general population [16–18,23], and are more likely to receive mental healthcare from primary care providers than Whites [24]. Yet, mental health care is not easily accessed or accepted among Black Americans as a result of the potential stigma of receiving a formal diagnosis and the cultural mistrust stemming from numerous racial disparities in health [25,26].

Research suggests that health risk behaviors (HRBs) mediate the relationship between childhood abuse and adult health [27]. Individuals often cope with the effects of adult symptoms of childhood trauma by engaging in unhealthy, avoidant behaviors, such as over-eating, smoking, and excessive alcohol use [28]. These behaviors often contribute to worsening psychological and physical symptoms [29]. Asking patients about HRBs could help providers understand patient-motivated alternatives for safer and healthier stress-related coping [30]. Providers could target HRBs with promising brief interventions and appropriate referrals as indicated.

Individuals with childhood trauma may benefit from trauma-informed interventions in primary care [18,31,32]. Empirical data supports using brief motivational interventions with patients of color in medical settings for alcohol use [33,34]. A recent review (2016) evaluated a number of trial-tested trauma-focused psychosocial interventions aimed at improving health outcomes among adults survivors of ACEs in primary care [32]. Another study showed that a reduction in avoidant coping related to reductions in traumatic stress [35]. Providing brief interventions in primary care to improve coping in adults who have experienced trauma may improve health outcomes associated with childhood adversity [36].

Experts recommend routine screening for ACEs among adult primary care patients and have demonstrated its feasibility in primary care settings [37–39], yet there is little research on how to respond to patients with ACEs. This pilot study will help fill that important knowledge gap. We hypothesized that it would be feasible to implement an intervention for ACEs within a busy primary care setting primarily serving low-income African American patients. Indicators of feasibility implementation outcomes included participant adherence to treatment; suitability, satisfaction, and acceptability of the intervention; in addition to participant clinical outcomes of perceived stress, HRBs and acceptance of a behavioral health referral.

## 2. Methods

### 2.1. Sample and recruitment

The study site, a Federally Qualified Health Center, serves low-income minority patients in Milwaukee, Wisconsin. Of their patients, 76% are Black, 76% have Medicaid, 60% are female, 44% are between 18 and 49 years old, 25% are aged 50 or older, and 27% have a mental health or substance disorder.

Eligible patients for the study were adult men and women who were English-speaking, clinic patients, and able to provide informed consent. Being black was explicitly stated in the eligibility consent form and was self-reported as a characteristic at baseline. This inclusion criterion was intended to target the majority clinic population to make the data more useful to clinicians who serve Black primary care patients with ACEs. Patients were excluded if they exhibited signs of active psychosis, dementia, delirium or intoxication, or were too physically ill to focus. To identify individuals at risk for reduced quality of life, mortality and morbidity due to childhood trauma, screening took place two days a week in the clinic waiting room. The Adverse Childhood Experiences (ACE) Questionnaire was administered as a screener. Patients with one or more ACEs were eligible to participate in the study intervention. The Primary Care Post-Traumatic Stress Disorder (PC-PTSD) Screen was also administered at screening, but not used to determine eligibility. Recruiting continued until 40 subjects were identified. Eligibility screening and delivery of the intervention sessions began in July 2017 through mid-December 2017.

### 2.2. Intervention development and components

The intervention translates trauma-informed medical care into actual clinical practice by screening for ACEs, assessing for health risk behavior, and motivating changes in health behaviors. The goal of the intervention is to promote positive mental, behavioral and physical health outcomes among primary care patients at-risk for ACE exposure and health disparities. These patients, low-income adults of color residing in central city urban neighborhoods, may not seek mental health treatment but are interested in improving behavioral and mental health and may be willing to receive mental health care.

The intervention was administered in accordance with a comprehensive written protocol that was developed a priori to guide the intervention delivery. The intervention was co-designed in close collaboration with the study Co-Investigator (R.B.) and administered by the study Principal Investigator (E.G.), who has expertise developing trauma education curriculum for health care professionals and working as a licensed mental health therapist with vulnerable populations. Additionally, R.B. has extensive experience conducting research on, and working with healthcare settings to implement, screening and intervention for a variety of important behavioral determinants of health. Fidelity to the protocol was checked by session notes written by the investigator.

A similar intervention, involving trauma screening, interview, and referral services, was implemented with a comparable patient population accessing community-based health care [13]. It was found to be both suitable and acceptable among patients, while also generating high referral acceptance rates to specialty mental health services. Both interventions were modeled after the widely accepted Screening Behavior Intervention Referral Treatment (SBIRT) paradigm, which incorporates Motivational Interviewing (MI) techniques, developed by Miller and Rollnick [40], and has been successfully implemented in primary care settings [41–44]. MI is a collaborative conversation that strengthens motivation by promoting self-efficacy and exploring ambivalence to change by asking open-ended questions and eliciting change-talk that is consistent with one's own values. Research shows that people who express change-talk are more likely to change a behavior [42].

### 2.3. Intervention procedure

The first session, lasting 45–60 min, took place at the clinic in a designated practitioner office. This session focused on providing education on the impact of trauma and associations to health risk behaviors, and the individual's own reasons for change. Participants were supported to identify ways of coping that could be compromising their quality of health and to connect with a specific behavior change that was personally important, intrinsically motivating, and consonant with their values. A motivational construct featuring three distinct change rulers measuring importance, confidence and commitment on a scale of 0–10 prompted discussion with participants about specific steps they had already taken and evoked additional ways to advance progress toward their desired change. Additional questions such as the pros and cons of making a change and the best and worst outcomes imagined by making a change assisted in developing further discrepancy between goals and current behavior. Questions about past accomplishments and the qualities that made those changes possible highlighted resilience and inherent strengths of the participants. The intervention featured in this study additionally utilized a behavior change plan that included goal setting to support participants to develop specific strategies to mitigate triggers with the purpose of reducing unhealthy habits and reinforcing healthier coping.

A second session, administered one month after initial treatment allocation and lasting approximately 20–30 min, occurred in-person (80%) or by phone (20%) according to the preference of the participant. This session was intended as a check-in to assess and support the

changes that the participant had made since the prior session by validating how those changes had been helpful and identifying the existing potential barriers to change. Individuals who expressed interest in exploring these issues further were introduced to an onsite counselor. A phone administered follow-up survey was performed one month after the second intervention session by a research assistant to reassess perceived stress, health risk behaviors, acceptance of a behavioral health referral and patient satisfaction.

#### 2.4. Evaluation design

This study collected process evaluation data using a monitoring design to assess adherence, suitability, and acceptability. A prospective cohort, experimental design with 2 post-intervention assessments was used to assess changes in participant outcomes of perceived stress and HRBs. Referral acceptance rates for behavioral health were also assessed. A trained research assistant helped administer the in-person eligibility screening, acceptability indicators, and completed follow-up reassessments by phone to minimize social desirability and maintain participant anonymity. Participants were mailed a \$50 gift card upon completion of the follow-up survey. The protocol was approved by the University of Wisconsin Health Sciences Institutional Review Board.

### 3. Measures

Feasibility was determined through indicators of adherence, suitability, and acceptability. A change in perceived stress and HRBs were assessed at 3 data collection time points (baseline, post-intervention, follow-up). Referral acceptance rates for behavioral health services were assessed at two time points (post-intervention and follow-up). All data were collected from study participants.

#### 3.1. Eligibility screen

##### 3.1.1. Adverse Childhood Experiences (ACE) Questionnaire

The 10-item ACE questionnaire was used to assess the number of ACEs exposure prior to age eighteen years of age [2]. Adversities included abuse (emotional, physical, sexual), neglect (emotional, physical), witnessing domestic violence, growing up with mentally ill, substance abusing, or criminal household members, and parental separation or divorce. A composite score for each participant with one or more ACEs was formed from binary responses by summing each item endorsed.

##### 3.1.2. Primary Care Posttraumatic Stress Disorder (PC-PTSD) Screen

The 4-item PC-PTSD screen assessed past-month PTSD symptoms and was consistent with the four diagnostic criteria of: intrusive experiencing, avoidance behaviors, hypervigilance, and emotional numbing [45]. Compared to structured diagnostic interviews, the PC-PTSD screen demonstrated high sensitivity (0.91) and moderate specificity (0.72) using a cutoff score of 2 within healthcare settings [46]. A composite PTSD score for each participant was formed from binary responses by summing each item endorsed. In this study, a PTSD score of 3 or more was used as an indicator of suitability.

#### 3.2. Feasibility implementation outcomes

##### 3.2.1. Participant adherence

The number of participants who completed ACE and PTSD screening and attended each intervention session represented participant adherence to treatment.

##### 3.2.2. Suitability

To measure suitability for the intervention to meet the needs of the participants in the sample we assessed the number and proportion of patients who had: (a) 4 or more ACE exposures, (b) PTSD score of 3 or

more, (c) correlation between ACE and PTSD scores, and (d) percentage of participants who had 4 or more ACEs or a positive PTSD screen and at least one self-identified HRB at baseline.

##### 3.2.3. Participant satisfaction

Participant satisfaction was assessed at three time points (i.e., baseline, post-intervention, and 2-month follow-up) using a 7-point Likert scale (1- extremely dissatisfied, 7 – extremely satisfied) for the following question: “How satisfied are you with the prior session?” An additional question was included at follow-up: “How likely are you to recommend this program to other people like you?”

##### 3.2.4. Session rating scale (SRS)

Session rating, assessed after sessions one and two by the 4-item SRS, evaluates individuals' perception of the therapeutic alliance with high internal consistency and correlation with other alliance measures [47]. The SRS assesses the extent to which patients feel heard and understood, agree that they working on the issues they want to work on, agree that the way they and the counselor worked made sense, and were satisfied with the overall session. Each item was rated on a continuum from 0 (negative) to 10 (positive) with a total possible score of 40.

##### 3.2.5. Treatment Acceptability and Preferences Scale (TAPS)

Treatment acceptability, assessed at follow-up by the 9-item TAP scale, evaluates perceived acceptability of behavioral interventions delivered within healthcare settings with acceptable psychometric properties [48,49]. Four subscales assess effectiveness, appropriateness, severity, and convenience with responses ranging from 0 to 4. The severity scale is reverse coded.

#### 3.3. Participant clinical outcomes

Pre-to-posttreatment differences were examined for perceived stress and HRBs at baseline, post-intervention, and follow-up. Referral acceptance rates were assessed at post-intervention and follow-up.

##### 3.3.1. Perceived Stress Scale (PSS-10)

The 10-item PSS, a questionnaire with established psychometric properties [50], measured the degree to which individuals perceive situations in their life to be stressful [51]. Higher levels of stress measured by the PSS have been linked to higher cortisol levels [52,53]. Participants responded to each item on a 5-point Likert scale ranging from 0 (never) to 4 (very often). After four items were reverse coded, the items were summed to create a composite score, where higher scores indicated higher perceived stress.

##### 3.3.2. Health risk behaviors

Patients were assessed for the six most common HRBs among individuals with ACEs – unhealthy alcohol use, drug use, smoking, poor nutrition habits, risky sexual behaviors and physical inactivity [10–12,31,54–56]. For each behavior, one yes-no question asked whether the individual was engaging in the behavior. Participants who indicated a positive response were then asked about quantity and/or frequency of the behavior in the past month. Phrases from validated questionnaires were used to assess for each health behavior: *unhealthy alcohol use*: > 3 standard drinks (12 oz of beer or wine cooler, 5 oz of wine, 1.5-oz of 80 proof liquor) or 7 in a week for women, and > 4 in a day or night or 14 in a week for men; *drug use*: marijuana, other illegal drugs or addictive medications for nonmedical reasons such as painkillers, stimulants or uppers, or sedatives and downers; *smoking*: in the past month, cigarettes smoked in a typical day; *poor nutrition habits*: eating lots of unhealthy food, or overeating in general; *risky sexual behaviors*: a) sex with lots of partners or people you don't know well, or not using condoms, b) number of sexual partners in the past month; *physical inactivity (exercise)*: at least 2.5 h per week of fast walking or

other activities that make you sweat. Exercise was reverse coded to show consistent results in the same direction as other HRBs.

### 3.3.3. Behavioral health referral

Acceptance of a behavioral health referral was assessed by asking: *Have you made an appointment or seen a counselor since our last session? If no, are you interested in a referral to a counselor to work on any of these issues such as stress or behavior change?*

## 4. Statistical analyses

Descriptive statistics were reported for demographic information, acceptability, and participant outcomes in terms of the total number of subjects and percentages of the sample for categorical variables and as means  $\pm$  standard deviations for continuous variables. Confidence intervals, medians, and min/max were reported for ACE and PTSD scores and acceptability outcomes. Mean imputation was used for individual missing responses. Kendall's Tau was used to calculate the association between ACE and PTSD scores.

To determine if PSS scores changed from baseline to post-intervention and follow-up, a linear mixed effects model was used to predict PSS scores based on time point. To account for individual differences, random intercepts for each participant were estimated. Differences from baseline and each time point were estimated along with 95% bootstrap confidence intervals. Significance was assessed based on a type one error rate of  $\alpha = 0.05$ . To determine if rates of each health behavior changed from baseline to post-intervention and follow-up, a binomial mixed effect logistic regression model was used to predict positive health behaviors based on time point, while adjusting with a random intercept for each participant. Statistical analysis was performed with R (version 3.4.4) [57] using the lme4 package (version 1.1–17) for the mixed effects model [58].

## 5. Results

The sample was comprised of 40 patients with one or more ACEs who were enrolled and had completed their first session. The mean age of participants was ( $M = 43.8 \pm 13.05$ , range: 20–64) years old. The majority of participants were female (67.5%), Black (92.5%), college-educated or higher (62.5%), lived with less than three household members (62.5%), and earned household yearly income of less than \$30,000 (90%). Currently, 37.5% of participants were receiving mental health counseling, while (78%) of the sample had received mental health counseling in the past. Additionally, participants reported chronic health conditions of blood pressure/hypertension, asthma, diabetes, high cholesterol, stomach problems, heart disease, and kidney disease. Characteristics of the participant sample are presented in Table 1.

Fig. 1 shows the participant flow through the study. Approximately, 291 patients were recruited in the clinic waiting room for screening (63.9% screening response rate). Out of 186 patients who were recruited and completed ACE and PTSD screens, 160 were eligible for the intervention with  $\geq 1$  ACEs. Subsequently, 107 patients agreed to schedule an enrollment meeting, although 67 (62.6%) did not show for unknown reasons. Although the initial enrollment response rate was 66.9%, the actual enrollment was 37.4%.

### 5.1. Feasibility implementation outcomes

#### 5.1.1. Participant adherence

Of the 40 patients who were enrolled and completed baseline measures and an initial intervention session, 36 (90%) completed the second intervention session and 35 (87.5%) had complete data at follow-up data participation. Two participants discontinued study participation and three were lost to follow-up.

**Table 1**  
Baseline characteristics of study participants.

Characteristic	(n = 40)
<b>Demographic</b>	
Age (years), mean $\pm$ SD	43.83 $\pm$ 13.05
Sex, n (%)	
Male, n (%)	13 (32.5)
Female, n (%)	27 (67.5)
Race, n (%)	
Black/African American	37 (92.5)
Mixed	3 (7.5)
Education, n (%)	
Some high school	5 (12.5)
High school diploma (GED)	10 (25.0)
College graduate or higher	25 (62.5)
Income, n (%)	
No income	7 (17.5)
< 10,000	12 (30.0)
10,000–30,000	17 (42.5)
> 30,000	3 (7.5)
Household members, n (%)	
< 3	25 (62.5)
3 or more	15 (37.5)
<b>Mental health services</b>	
Past mental health counseling, n (%)	31 (77.5)
Current mental health counseling, n (%)	15 (37.5)
<b>Health status</b>	
Chronic conditions, n (%)	
Asthma or other lung disease	11 (27.5)
Cancer	0 (0.0)
Diabetes	11 (27.5)
Heart disease	3 (7.5)
High blood pressure/hypertension	18 (45.0)
High cholesterol	7 (17.5)
Kidney disease	1 (2.5)
Liver disease	0 (0.0)
Stomach or intestinal problems	5 (12.5)
Other problems <sup>a</sup>	11 (27.5)
None	6 (15.0)
Adverse childhood experiences (ACE), n (%)	
1–3 ACEs	14 (35.0)
4 or more ACEs	26 (65.0)
Posttraumatic stress disorder (PTSD), n (%)	
0 PTSD symptoms	5 (12.5)
1–2 PTSD symptoms	12 (30.0)
3 or more PTSD symptoms	23 (57.5)

SD = standard deviation; values in parentheses are percentages; <sup>a</sup>Other self-reported chronic conditions included: chronic pain (e.g., upper and lower back pain, neuropathy, migraines, fibromyalgia, arthritis), insomnia, gout, blood clot, thrombocytopenia, arteriovenous malformation, seizures, hyperthyroidism, mild cerebral palsy, degenerative disk disease, urinary tract infection, spinal stenosis, complete spinal cord injury, bipolar disorder, anxiety, and depression.

#### 5.1.2. Suitability

Of the 188 patients in the waiting room who were screened for eligibility, 76 (40.4%) had 4 or more ACEs and 51 (27.1%) of those had a positive PTSD screen. Of the 40 eligible patients with one or more ACEs who participated in the intervention, 26 (65%) participants reported four or more ACEs and 23 (57.5%) participants had positive PTSD screens. ACE and PTSD scores were positively associated ( $T = 0.434$ ,  $p < 0.001$ ). Similarly, 11 (27.5%) intervention participants had 4 or more ACEs or a positive PTSD screen with at least one HRB, while 18 (45%) endorsed all three. Descriptive statistics for ACE and PTSD scores are presented in Tables 1 and 2.

#### 5.1.3. Acceptability

Post-session averages for acceptability outcomes are presented in Table 2. Participants reported being “moderately satisfied” or “extremely satisfied” 37 (94.9%) for session one and 34 (94.5%) for session two. At follow-up (2-months from baseline), 33 (94%) participants

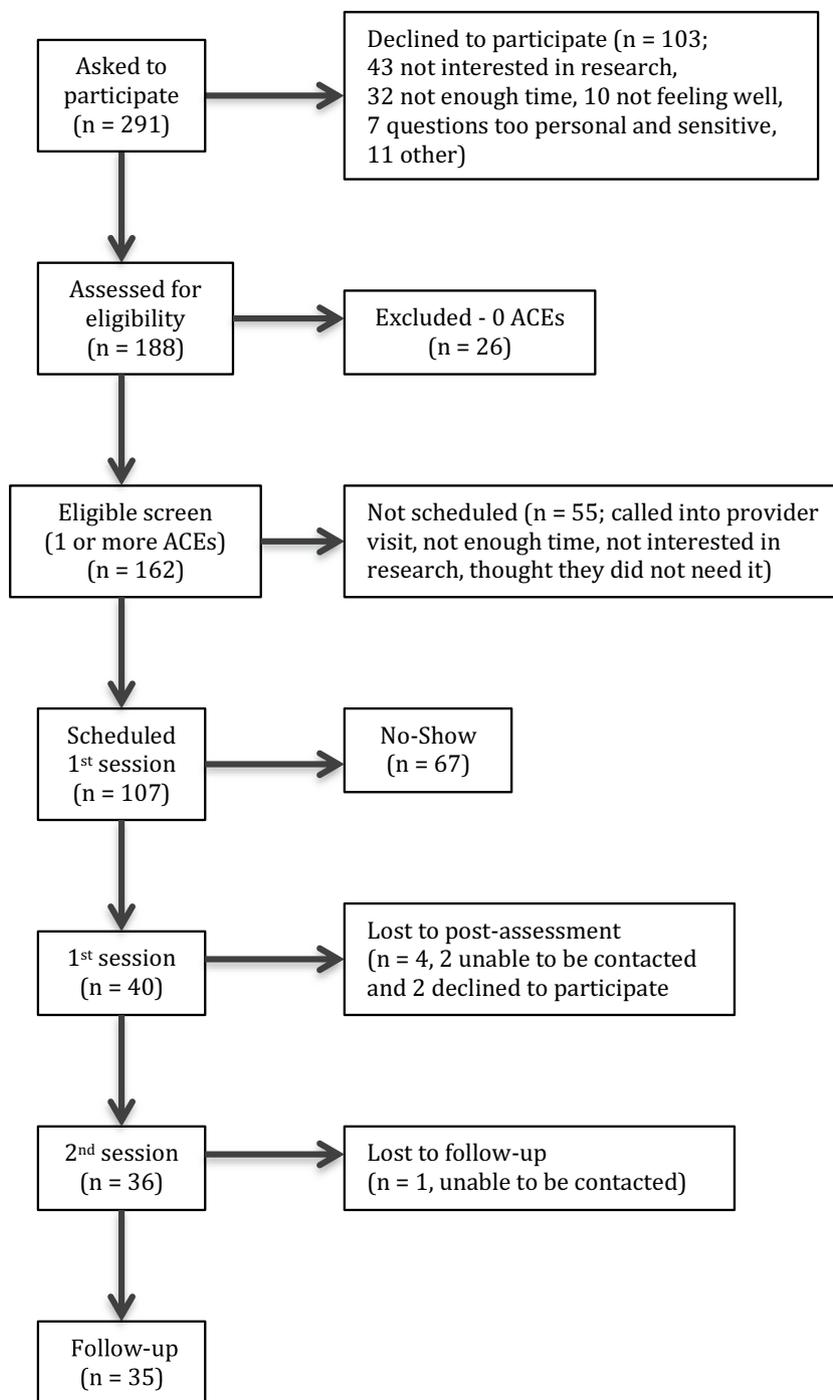


Fig. 1. Participant flow through the study.

reported being “moderately satisfied” or “extremely satisfied” with the overall program, while 29 (82.8%) were “somewhat likely” or “extremely likely” to recommend the program to other people like them. On average, participants rated the therapeutic alliance a total of 37.6 out of 40 possible points for the first session and 38.6 out of 40 points for the second session.

Participants who completed the TAP measure at follow-up rated the overall acceptability of the intervention between acceptable and very acceptable with an average total score of 24.7 out of 45 possible points. The effectiveness subscale ( $M = 2.56 \pm 0.84$ ) reflected a rating between effective and very effective. The appropriateness subscale ( $M = 2.47 \pm 0.86$ ) indicated a rating between appropriate and very appropriate. Severity of risks or side effects of the treatment

( $M = 3.57 \pm 0.85$ ) yielded a sample mean approaching a rating of not severe at all. The score for the convenience of application subscale ( $M = 2.39 \pm 0.75$ ) fell between convenient and very convenient.

## 5.2. Participant clinical outcomes

### 5.2.1. Perceived stress

PSS scores changed significantly over time (Table 3), dropping by 6.11 points from baseline to post-intervention (CI:  $-8.19$ – $3.64$ ,  $p < 0.001$ ). This effect was sustained and PSS scores remained an estimated 6.56 points lower than baseline at follow-up (CI:  $-8.54$ – $4.61$ ,  $p < 0.001$ ).

**Table 2**  
Descriptive statistics for ACE and PTSD scores and acceptability outcomes.

	N	M (SD)	95% CI	Median	Min, Max	Time
ACE score	40	5.1 (2.77)	[4.26, 5.97]	5	(1, 10)	T0
PTSD score	40	2.65 (1.44)	[2.18, 3.09]	3	(0, 4)	T0
Participant satisfaction	39	6.74 (0.75)	[6.46, 6.92]	7	(3, 7)	T1
Participant satisfaction	36	6.75 (0.55)	[6.56, 6.92]	7	(5, 7)	T2
Session rating scale	39	9.49 (0.79)	[9.24, 9.72]	10	(6.75, 10)	T1
Session rating scale	36	9.66 (0.51)	[9.47, 9.81]	10	(8.25, 10)	T2
TAPS	35	2.62 (0.63)	[2.41, 2.84]	2.67	(0.89, 3.78)	T3

*Abbreviations.* ACEs = adverse childhood experiences; PTSD = Posttraumatic Stress Disorder; TAPS = Treatment Acceptability and Preferences Scale; N = sample size; M = mean; SD = standard deviation; CI = confidence interval; T0 = baseline; T1 = post-session 1; T2 = post-session 2; T3 = follow-up (2-months after baseline).

**5.2.2. Health risk behaviors**

All but one participant identified at least one risky or unhealthy behavior at baseline. Rates of HRBs decreased from baseline to post-intervention, and the declines for unhealthy alcohol use, poor nutrition habits, and risky sexual behaviors were statistically significant (Table 3). The odds of unhealthy alcohol use at post-intervention were lower than the odds at baseline by a factor of 0.167 (CI: 0.033–0.843,  $p = 0.03$ ). This effect was nearly sustained at follow-up as compared to baseline ( $p = 0.063$ ). The odds of poor nutrition habits at post-intervention were lower than the odds at baseline by a factor of 0.119 (CI: 0.0297–0.479,  $p = 0.003$ ). However, this effect was not maintained from baseline to follow-up in which participants experienced no change in poor nutrition habits ( $p = 0.504$ ). The rate of participants reporting risky sexual behaviors dropped significantly from baseline to post-intervention ( $p < 0.001$ ), and the decline was nearly sustained at follow-up ( $p = 0.063$ ). No differences in drugs, physical inactivity, and smoking behaviors were found from baseline to post-intervention or follow-up.

**5.2.3. Behavioral health referral**

At post-intervention, 14 of the 40 (38.9%) intervention participants had made an appointment or seen a counselor since their first session and 15 (41.7%) were interested in a referral to a counselor. At follow-up, 11 (31.4%) participants had made an appointment or seen a counselor since their last session and 10 (28.6) were interested in a referral to a counselor. Only 37.5% of patients were receiving psychological counseling at baseline. A total of 12 (30%) additional participants were connected with behavioral health services throughout the course of the study.

**6. Discussion**

This study found that it is feasible to deliver ACE and PTSD screening and brief intervention services within a community-based

primary care clinic that serves patients at high risk for health inequities. In a sample of low-income, Black patients at risk for ACE exposure, nearly two-thirds of the sample with 4 or more ACEs and/or positive PTSD screens had at least one of the six HRBs common to individuals with ACEs. These results demonstrate the appropriateness or suitability for this population of an intervention aimed at addressing and reducing stress and health risk behaviors and increasing behavioral health referral acceptance.

Approximately, 86% of the individuals who responded to the ACE screener had one or more ACEs and about half of those screened positive for PTSD. This high rate of exposure and potential PTSD is congruent with results from other studies with high-risk groups [13,17,18,59]. For example, Topitzes and colleagues found that 90% of a predominantly African American and Latino population living in similar neighborhoods reported one or more potential traumatic events, while 50% screened positive for PTSD [13]. Only 7 out of 291 (2.4%) individuals refused to participate in ACE-related research because they found the ACE questions to be too sensitive. This finding comports with research indicating that respondents typically tolerate questions about childhood trauma [13,15,60].

Only 25% of the patients who screened eligible with one or more ACEs participated in an initial intervention session. A low engagement rate highlights an important challenge of working with low-income patients of color in a central city primary care clinic. Low engagement may have occurred because the intervention was delivered in the context of research. Future studies should assess participation rates when services are delivered by clinic staff. A high retention rate of 36 out of 40 participants in attendance for the second intervention session is a marker of engagement in care that can be indicative of enhancing patient health outcomes [61,62].

Those who participated in the intervention readily accepted the brief treatment. They reported high satisfaction, therapeutic alliance and overall acceptability. It is well established that alliance is strongly correlated with outcomes [63], and that higher indices of acceptability

**Table 3**  
Pre-post treatment and follow-up differences in perceived stress scores and health risk behaviors.

	Baseline (n = 40)	Post-intervention (n = 36)	Follow-up (n = 35)	95% CI baseline to post-intervention	95% CI baseline to follow-up
Perceived stress score, mean ± SD	19.2 ± 5.51	13.1 ± 6.58	12.7 ± 7.45	(−8.19, −3.64)***	(−8.54, −4.61)***
Health risk behaviors, n (%)					
Unhealthy alcohol use	12 (30.0)	4 (11.1)	5 (14.3)	(0.033, 0.843)*	(0.0529, 1.08)
Drug use	9 (22.5)	8 (22.2)	5 (14.3)	(0.0973, 153)	(0.00128, 9)
Smoking	17 (42.5)	13 (36.1)	11 (31.4)	(0.0269, 5.29)	(0.00185, 1.38)
Poor nutrition habits	22 (55.0)	8 (22.2)	17 (48.6)	(0.0297, 0.479)**	(0.219, 2.11)
Risky sexual behaviors	5 (12.5)	0 (0.0)	1 (2.9)	(0, 0)***	(5.41e−15, 2.35)
Physical inactivity	22 (55.0)	18 (50.0)	14 (40.0)	(0.222, 2)	(0.121, 1.19)

SD: standard deviation; CI: confidence interval.

\*  $p < 0.05$ .

\*\*  $p < 0.01$ .

\*\*\*  $p < 0.001$ .

are more likely to produce better clinical outcomes [64]. This finding underscores the importance of using well-trained health professionals to comfortably discuss the impact of trauma and abuse with their patients.

The intervention seemed effective in reducing perceived stress. The statistically significant reduction of 6.56 points on a 40-point scale seems clinically significant, as the mean score moved from moderate to low stress. The final mean was two points lower than reported norms for healthy Black adults in the general population based on a L. Harris Poll that gathered information using the PSS-10 in the United States [65]. Reductions in stress are linked to more effective coping and can lead to better health outcomes and improved overall well-being and quality of life [66,67].

Results from the session notes show that patients are willing to identify HRBs. Rates of all unhealthy behaviors declined in their raw scores. Reduced engagement in risky behaviors suggest that patients can effectively change certain behaviors in a short period of time. This finding also aligns with prior research, which has shown that brief interventions can help people with smoking cessation and mild to moderate alcohol problems [32,68]. It is possible that offering additional booster sessions would increase and prolong changes in health-related behaviors.

Despite the notably high ACE prevalence, nearly one-third of intervention participants were connected to behavioral health services during the course of the study. These results are noteworthy given the typical stigma and inaccessibility of mental health services for patients of color [25,69]. This is suggestive of the potential for the intervention to produce acceptance of a behavioral health referral, particularly among patients who may not otherwise receive mental health services.

A number of limitations attend this study. First, it lacked both a comparison group against which to judge change over time and sufficient power with which to detect significant change over time. This was a proof of concept study intended to develop the intervention, assess feasibility, and inform future efficacy trials. Second, there was potential for social desirability bias to influence participants' assessment results. To mitigate this internal threat to validity, someone other than the interventionist administered assessments. Third, it is likely that participants in this sample were highly motivated to change a HRB indicated by high readiness scores at baseline. Although we did not follow-up with individuals who did not show for their first scheduled session, the typical barriers that many individuals in this population face include available transport, childcare support, and time away from work. Future studies should assess and help individuals troubleshoot these potential barriers in advance.

## 7. Conclusion

This study provides insights into ACE-related screening and intervention within primary care urban settings serving low-income African American patients. The intervention could help patients develop better ways of coping with stress and consequently could help primary care clinics address the impact of trauma on health among their patients. Field researchers should conduct an efficacy trial to test intervention effects on proximal outcomes of mental health and stress and distal outcomes of healthcare utilization, cost-savings, and morbidity. If such studies are positive, implementation scientists should assess how to integrate trauma screening and brief intervention within typical primary healthcare workflows and to engage trauma-affected patients in brief intervention and referral to treatment services.

## Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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