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 JOURNAL OF
 ADOLESCENT
 HEALTH

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Original article

Promoting Healthy Attitudes and Behaviors in Youth Who Experience Homelessness: Results of a Longitudinal Intervention Study

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Article history: Received September 11, 2021; Accepted December 22, 2021

Keywords: Homelessness; Youth; Psychological capital; Life satisfaction; Intervention; Health promotion; Longitudinal; Multi-site; Solomon four-group design

 A B S T R A C T

Purpose: The aim of this study is to determine the effectiveness of a brief intervention to promote responsible substance use and safe sex behaviors in youths experiencing homelessness (YEH).

Methods: Design: A Solomon four-group (double randomized controlled trial) longitudinal design with repeated measures (3- and 6-month follow-ups) was used in drop-in centers for YEH in Austin, Texas and Columbus, Ohio from which 602 youths, 18–24 years-old ($M = 21 \pm 1.8$), 50% white; 69.9% heterosexual were recruited. A manualized one-on-one intervention consisted of six modules delivered via laptop computers. Modules focused on communication, goal-setting, substance use refusal, safe sex behaviors, enhanced psychological capital (hope, optimism, resilience, self-efficacy, gratitude), and life satisfaction. Valid and reliable measures of hope, optimism, future time perspective, resilience, social connectedness, gratitude, condom intention, self-efficacy for safe sex, safe sex behaviors, self-efficacy for substance use refusal, and life satisfaction were used to collect data for which three hypotheses were tested, using intent to treat, with multi-level modeling (R).

Results: The analysis showed partial support for all hypotheses: (1) post-test outcomes were greater than pretests; (2) intervention group outcomes were greater than control group measures; and (3) significant effects for pretesting. YEH in Ohio completed significantly more sessions than YEH in Texas ($p = .001$), but took significantly longer to complete all six sessions ($p = .001$).

Discussion: This brief intervention had significant effects on YEH to promote healthy attitudes and behaviors that merit further testing in larger samples.

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 IMPLICATIONS AND
 CONTRIBUTIONS

A brief intervention showed improvements in psychological variables of hope, optimism, condom intention, safe sex behaviors, and life satisfaction, maintained at 6-month follow-up. Results suggest that youths experiencing homelessness are motivated to develop positive attitudes and health-promoting behaviors. Further research is warranted to determine the most effective dosage of the intervention.

Registered at: clinicaltrials.gov [NCT02553616].

Conflict of interest statement: The authors have no conflicts of interest to disclose.

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As night falls, millions of young people worldwide struggle to find a safe place to sleep; youths experiencing homelessness (YEH) include those who are street-dependent and unstably housed. The exact numbers of youth between the ages of 18–24 years who experience homelessness on a regular basis are unknown. Estimates are, however, that in the United States alone, they are among over half a million people, up to the age of

24, who are without a home for more than a week during a single year [1]. They are generally underserved, understudied, and profoundly vulnerable to health-risk behaviors—most notably to substance use and risky sex that lead to adverse health conditions globally such as HIV/AIDS, substance abuse, and addiction [2,3]. The association between substance use and risky sexual behavior in YEH has been well documented [4–6].

Despite the limitations in our knowledge of this population, we do have evidence that YEH experience a substantial unmet need for health care and social services that can impact substance use and sexual risk-taking [7]—particularly services that are strength-based. Like other young people, they have the capacity to thrive in the face of adversity, which is often overlooked or underappreciated in the delivery of services. For example, YEH have untapped strengths such as their knowledge of community resources that assure their survival on the street [8]. Yet, YEH are often reluctant to access community resources and authorities, requiring service providers to rethink how they engage with this population of high-risk yet resilient young people. There is some evidence that programs for YEH not only have inadequate funding, but that the funded organizations are “dysfunctional,” lacking support and resources to prevent staff burnout and, as a result, prevent them from providing effective services (p. 211) [9]. Although communities may receive federal grants to provide services for youth experiencing homelessness, programs were not able to meet the national objective of ending youth homelessness by 2020 [10].

Previous intervention studies targeting substance use and risky sexual behavior of YEH have been limited in number and scope; they have been conducted primarily in industrialized countries such as the United States and have focused on YEH's deficits and pathologies. Studies of group interventions with multiple sessions have met with mixed results owing to small samples and high losses to follow-up [11,12]. Some intervention studies were done primarily in sheltered settings in a single geographic location and the majority focused on substance use alone [11,13], whereas others focused on sexual/HIV risk behaviors alone [14,15]. Most intervention studies with YEH have used pre-post designs with few follow-up measures [16,17]. Additionally, to date the effect of pretesting has not been examined, which would help to further isolate the impact of the intervention, and few, if any, significant differences in post-tests have been found between those who did and those who did not receive an intervention [13,18,19].

Purpose

There are gaps in the literature on YEH concerning the assessment of interventions and the effect of pretesting on intervention outcomes and on long-term intervention efficacy. Thus, the purposes of this longitudinal study were to determine the effectiveness of a self-reflective motivational intervention to enhance psychological capital and promote responsible substance use and safe sex behaviors in YEH, ages 18–24 years, and to determine the effect of pretesting on outcomes. We hypothesized the following:

1. Participants randomly assigned to the intervention will score higher on all postintervention measures of psychological capital (optimism, hope, future time perspective [FTP], social connectedness, and gratitude) and outcomes of condom use intentions, safe sex behaviors, self-efficacy to refuse

substances and negotiate safe sex, as well as life satisfaction than on the same preintervention measures (pre-post comparison).

2. Intervention participants will score higher than will nonintervention control participants on all post-test measures (intervention-control comparison).
3. Participants who complete pretests prior to the intervention or control condition will score higher on outcomes than those who did not complete pretests.

The aim was to test the effectiveness of the intervention primarily on the behavioral outcomes of intention to use condoms, safe sex behaviors, safe sex self-efficacy, and substance refusal self-efficacy and secondarily on the psychological capital factors believed to influence these outcomes (hope, optimism, FTP, resilience, social connectedness, and gratitude), as well as life satisfaction.

Intervention

Details about the brief intervention are published elsewhere [8]. The intervention, pilot-tested with this population in an earlier study, consisted of six psychoeducational modules delivered one-on-one by trained graduate research assistants. The modules focused on factual information and skill development such as assertive communication, general goal setting, correct usage of both male and female condoms, and refusal of risky behavior that YEH need to promote their health particularly to avoid or decrease their use of substances such as alcohol and other drugs and increase their safer sexual behaviors. The intervention was based on principles of motivational interviewing and positive psychology, including the enhancement of psychological capital (e.g., hope, efficacy, resilience, and optimism) [22] and life satisfaction.

Methods

Design

We used a Solomon four-group design, which is the only experimental design that tests for the effect of “pretest sensitization,” to test three hypotheses [20,21]. Pretest sensitization means that merely administering a test, in and of itself, may be the stimulus that leads to a significant change in the outcome [21] (p. 9). The design consists of a double randomized controlled trial in which two groups of participants are pretested and two groups are not, thus controlling for this pretest sensitization.

Setting and sample

The brief intervention took place in two geographical locations: Austin, Texas, and Columbus, Ohio. YEH, ages 18–24 years, who sought and received health and social services from drop-in centers (DICs) in these two cities, were randomly assigned to one of four conditions: (1) pretesting and the intervention; (2) pretesting and services as usual (SAU); (3) no pretesting and intervention; and (4) no pretesting and SAU. A total of 602 youths enrolled in the study (44% from Texas; 56% from Ohio). All participants and research staff were blinded to the condition assigned at the time of enrollment.

Columbus has one DIC for homeless youth between the ages of 14 and 24 years. This center serves over 1,000 unduplicated

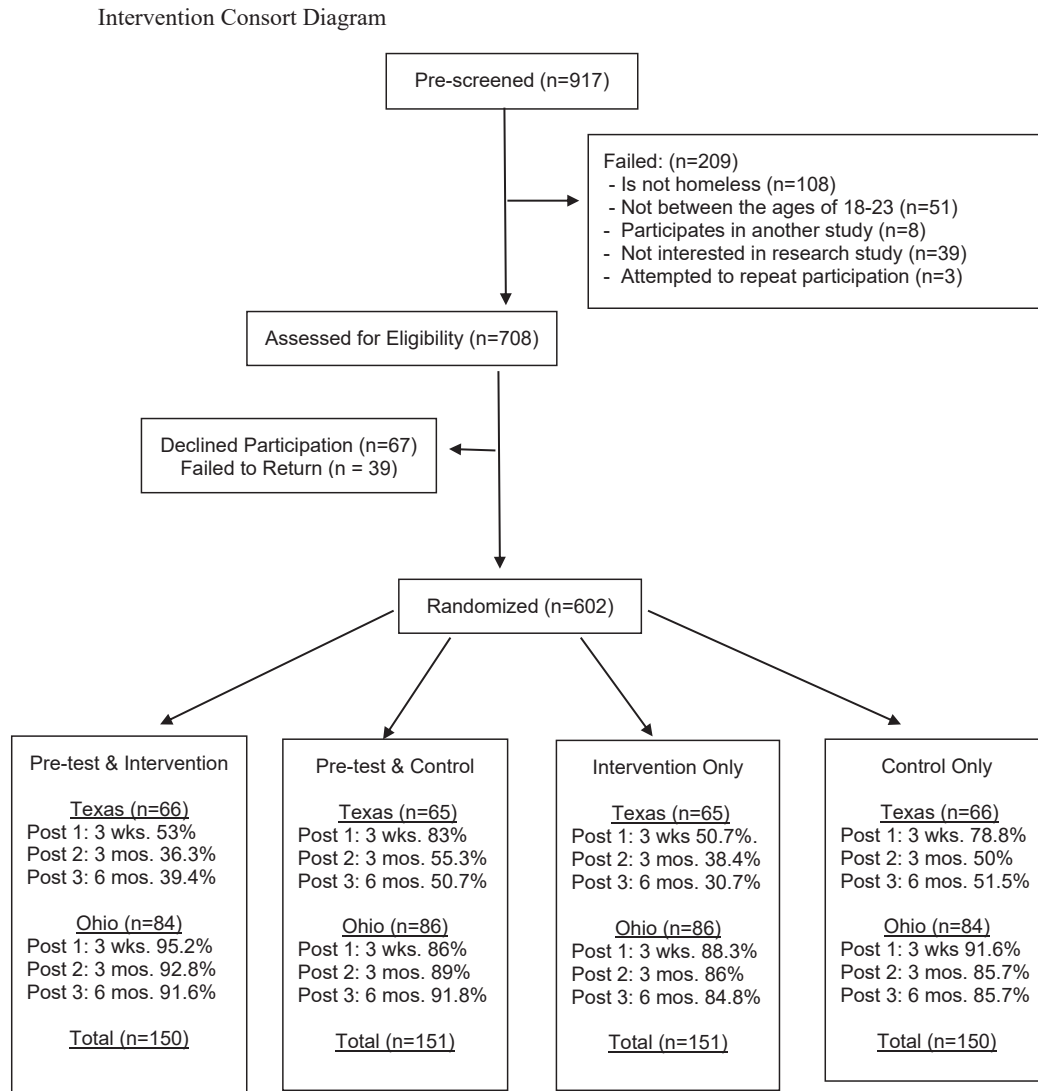


Figure 1. Intervention consort diagram.

youth annually and offers a range of onsite services including counseling, health, education, vocational, and housing from various service organizations. The center is open 7 days/week, 24 hours/day. For this study, the research staff (a part-time research associate and graduate research assistant) maintained two offices within the DIC and were present for 8 hours/day. These staff, while separate from the DIC, developed working relationships with the center staff, and the youth. The research staff engaged with youth during the day, developing relationships and building trust and connections. Follow-up assessments were conducted at 3 weeks, and 3- and 6 months. Follow-up rates never dipped below 85%, ranging from 85% to 95%.

Despite its size and location, Austin serves YEH with only two part-time DICs. One of the centers serves homeless young adults through 28 years of age. The other advocates for youth ages 18–26 and has two affordable housing communities for youth exiting homelessness. As in the Ohio site, research staff were not employed by the centers but developed working relationships with the DIC staff and with youth accessing the sites. In contrast

to the Ohio site, which offered services to YEH 24/7/365, the two centers in Texas offered services at variable times throughout the year, but maximally only 3 days/week at each site.

When the study began, only one DIC for YEH in the Austin area was available; however, within 2 months, two DICs in Austin were providing services and were open to recruitment and enrollment in the study. As we neared the end of our targeted enrollment of 300, the COVID-19 pandemic occurred, and we had to stop recruitment and final enrollment at $N = 262$. Follow-up assessments at 3 weeks (53%–83%), 3- and 6 months (31%–52%) in Austin were significantly lower than those in Columbus (Figure 1).

Procedures

Institutional Review Boards from the first two authors' respective universities provided full-board reviews and approvals for the study. Prior to enrollment at the respective sites, staff working in these facilities informed potential participants of the study and referred them to appropriate trained research

Table 1

Descriptors and Cronbach's alpha of theoretical measures used in longitudinal study of an intervention to promote healthy behaviors in youth experiencing homelessness

Variable/Scale (1st author, publication date) example	Format (no. of items)	Score range	Cronbach's alpha
Hope (Snyder, 2003) [23] "I can think of many ways to reach my current goals"	8-point Likert (6) 1 = definitely false; 8 = definitely true	6–48	0.78–0.85
Optimism (Scheier, 1985) [24] "I do not get upset too easily"	5-point Likert (12) 0 = strongly disagree; 4 = strongly agree	0–48	0.72–0.74
Future time perspective (Heimberg, 1963) [25] "I have great faith in the future"	7-point Likert (4) 1 = disagree; 7 = agree	7–28	0.79–0.81
Resilience (Wagnild, 1993) [26] "I take things one day at a time"	7-point Likert (25) 1 = disagree; 7 = agree	25–175	0.87–0.90
Social connectedness (Blum, 1989) [27] "How much do you feel that adults care about you?"	5-point Likert (9) 1 = not at all; 5 = very much	9–45	0.84–0.85
Gratitude (McCullough, 2002) [28] "I am grateful to a wide variety of people"	7-point Likert (6) 1 = strongly disagree; 7 = strongly agree	6–42	0.71–0.76
Intention to use condoms (Jemmott, 1991) [29] "I plan to use condoms if I have sex in the next 3 months"	5-point Likert (5) Variable responses (neg to pos)	5–25	0.87–0.90
Safe sex behavior (Dilorio, 1992) [30] "I ask my potential sexual partners about a history of IV drug use"	4-point Likert (7) 1 = never; 4 = always	4–28	0.90–0.92
Self-efficacy for substance refusal ^a "I would be able to resist the urge to not drink heavily if I had trouble sleeping"	% Confident (8) 0 = not at all; 100% = completely	0–100	0.85–0.89
Self-efficacy for safe sex (Hanna, 1999) [31] "I feel sure that I could say 'no' to sex if my partner refused protection/condom"	5-point Likert (5) 1 = very unsure; 5 = very sure	5–25	0.78–0.84
Life satisfaction (Pavot, 1993) [32] "I am satisfied with my life"	5-point Likert (5) 1 = strongly disagree; 7 = strongly agree	5–25	0.80–0.85

^a Personal communication, N. Slesnick.

personnel who then obtained written informed consent to participate. Because some of the data that were collected for this study were of a sensitive nature, we obtained a Certificate of Confidentiality from the National Institutes of Health.

Randomization to one of the four groups was predetermined through a computer-generated list and determined by the participant's order of enrollment in the study at each of the two sites. Both sites followed the same predetermined order of assignment to groups. Participants who voluntarily enrolled in the study provided demographic data via interview upon enrollment. The intervention facilitators who collected baseline data were blinded to the random assignment of participants. Participants who were randomly assigned to the groups who completed pretests, provided additional data on theoretical variables at the time of enrollment, and at three additional times: after 3 weeks, 3 months, and 6 months. Participants who were randomly assigned to the control SAU groups who did not complete pretests, provided additional data on theoretical variables at the same three time points following enrollment. All data were collected by research staff who were not the same individuals who provided the participants' interventions. SAU were provided by the DICs' staff who were not part of the respective research teams. Owing to the closure of the DICs in Texas at the onset of the COVID-19 pandemic, the final (Time 3) data collection of 20 participants was done by phone or Facebook.

Measures

Data were collected with an investigator-developed demographic form and a battery of valid and reliable measures of

theoretical variables; primary variables were hope, optimism, FTP, resilience, social connectedness, gratitude, intention to use condoms, safe sex behaviors, self-efficacy for substance refusal, and self-efficacy for safe sex, life satisfaction [23–32]. Secondary variables consisted of demographics that were measured for all participants at enrollment only. Table 1 is a summary of all theoretical measures, including format and number of items for each scale, scale endpoints, and range of Cronbach's alpha reliability coefficients for the overall sample at each time they were measured (pretest, 3 weeks, 3 months, and 6 months following enrollment).

Data analysis

Using an intent-to-treat approach, we modeled effects over time on all 11 outcome measures simultaneously, in a multilevel model [33]. The model we used has the advantage of partially pooling data between outcome measures [34], increasing precision of effect estimates and avoiding the need for multiplicity corrections [35]. We first put the data in "long" format, with a row of the data frame for each unique combination of participant, measurement occasion, and outcome measure. This format has the additional advantage of allowing model estimation incorporating participants without outcome measurements at all four time points (pretest, and post-test times 1, 2, and 3)—most importantly, it allows model estimation including participants from all four randomization arms, with and without pretest measurements, together. We divided each set of outcome measures by the standard deviation of the corresponding measure at

Table 2

Change from baseline in each outcome score for each subsequent measurement occasion, with standard errors in parentheses, estimated from the multilevel model

Outcome	Group	Time 1	Time 2	Time 3
Average outcome	Control	0.03 (0.05)	0.14 (0.06)*	0.22 (0.06)***
	Intervention	0.13 (0.06)*	0.12 (0.05)*	0.20 (0.06)***
Future time perspective	Control	−0.04 (0.08)	−0.00 (0.08)	0.08 (0.09)
	Intervention	0.05 (0.09)	0.06 (0.07)	0.09 (0.08)
Gratitude	Control	0.06 (0.08)	0.16 (0.08)****	0.25 (0.09)**
	Intervention	0.17 (0.09)****	0.15 (0.07)*	0.23 (0.08)**
Hope	Control	0.12 (0.08)	0.24 (0.08)**	0.33 (0.09)***
	Intervention	0.22 (0.09)**	0.20 (0.07)**	0.30 (0.08)***
Condom intention	Control	0.07 (0.08)	0.15 (0.08)	0.24 (0.09)**
	Intervention	0.18 (0.09)*	0.17 (0.07)*	0.24 (0.08)**
Life satisfaction	Control	0.20 (0.08)**	0.42 (0.08)***	0.52 (0.09)***
	Intervention	0.30 (0.09)***	0.26 (0.07)***	0.43 (0.08)***
Optimism	Control	0.08 (0.08)	0.20 (0.08)*	0.29 (0.09)**
	Intervention	0.18 (0.09)*	0.17 (0.07)*	0.26 (0.08)**
Resilience	Control	0.05 (0.08)	0.16 (0.08)	0.25 (0.09)**
	Intervention	0.13 (0.09)	0.12 (0.07)	0.22 (0.08)**
Safe sex self-efficacy	Control	−0.07 (0.08)	0.04 (0.08)	0.12 (0.09)
	Intervention	0.00 (0.09)	0.02 (0.07)	0.09 (0.08)
Safe sex	Control	0.08 (0.08)	0.14 (0.08)	0.23 (0.09)*
	Intervention	0.20 (0.09)*	0.18 (0.07)*	0.24 (0.08)**
Social connectedness	Control	0.15 (0.08)*	0.25 (0.08)**	0.35 (0.09)***
	Intervention	0.27 (0.09)**	0.24 (0.07)**	0.33 (0.08)***
Substance refusal self-efficacy	Control	−0.33 (0.08)***	−0.22 (0.08)**	−0.17 (0.09)
	Intervention	−0.28 (0.09)**	−0.22 (0.07)**	−0.19 (0.08)*

* $p < .05$; ** $p < .01$; *** $p < .001$; **** $p < .10$.

baseline (pretest), so that all outcomes are measured on the same scale.

To estimate effects of treatment over time and of pretest measurement, we regressed the outcome measures on an intervention indicator interacted with dummy variables for times 1, 2, and 3, dummy variables for whether pretest was measured, state, sex, Latinx ethnicity, Black race, high school graduation, current school enrollment, history of sexual abuse, HIV status, current tobacco use, and sexual orientation (straight or bisexual, with gay/lesbian/queer as a reference category). We also included random intercepts for participant—accounting for clustering of measurements within participants—and for outcome measure, and random slopes for intervention group interacted with time and pretest, varying with outcome measure. These latter random slopes estimate differences in the effects of the intervention over time, and of the measuring pretest, on different outcome measures. The fixed coefficients on the interaction by time interactions give the effects of the intervention

at the three post-treatment time points, averaged over all 11 outcome measures. The effect of assignment to intervention group on a particular outcome measure at a particular time is estimated as the sum of the fixed coefficient of the interaction between the intervention measure and the dummy variable for that time point, and the random slope for the same interaction, for the outcome measure of interest.

All models were fit using the lme4 package in R version 3.6.2 [36]. To estimate standard errors, confidence intervals, and p -values for outcome-specific intervention effects, we used the fixed-effect standard errors and random-effect conditional variance-covariance matrix provided by the software. The standard error for intervention effect at a particular time was estimated as the square root of the sum of the squared fixed-effect standard error and the variance of the appropriate random slope. p Values and Wald confidence intervals were approximated using standard normal theory. We checked model fit by inspecting standard fit measures and residual plots, and by comparing

Table 3

Differences between outcome measures among YEH in intervention and control groups

Outcome	Baseline	Time 1	Time 2	Time 3
Average	−0.01 (0.06)	0.10 (0.04)*	−0.02 (0.05)	−0.02 (0.04)
Hope	−0.01 (0.06)	0.11 (0.05)*	−0.05 (0.06)	−0.02 (0.05)
Optimism	0.00 (0.06)	0.09 (0.05)*	−0.02 (0.06)	−0.03 (0.05)
Future time perspective	0.01 (0.06)	0.01 (0.05)*	0.04 (0.06)	0.02 (0.05)
Resilience	0.04 (0.06)	0.08 (0.05)***	−0.05 (0.06)	−0.03 (0.05)
Social connectedness	−0.03 (0.06)	0.11 (0.05)*	−0.01 (0.06)	−0.03 (0.05)
Gratitude	−0.01 (0.06)	0.09 (0.05)*	0.02 (0.06)	−0.02 (0.05)
Condom intention	−0.03 (0.06)	0.11 (0.05)*	0.00 (0.06)	−0.01 (0.05)
Safe sex behavior	−0.04 (0.06)	0.13 (0.05)**	0.05 (0.06)	0.02 (0.05)
Self-efficacy substance refusal	−0.03 (0.06)	0.05 (0.05)	−0.01 (0.06)	−0.01 (0.05)
Self-efficacy safe sex	−0.00 (0.06)	0.06 (0.05)	−0.02 (0.06)	−0.03 (0.05)
Life satisfaction	−0.04 (0.06)	0.10 (0.05)*	−0.17 (0.06)**	−0.08 (0.05)

YEH = youths experiencing homelessness.

* $p < .05$; ** $p < .01$; *** $p < .10$.

Table 4

Sample sizes and outcome score averages for each measurement occasion by control and intervention conditions (standard deviations in parentheses)

Outcome	Condition	Baseline	Time 1	Time 2	Time 3
Sample Size (n)	Control	133	256	216	216
	Intervention	121	224	196	194
Hope	Control	4.70 (1.02)	4.79 (0.99)	4.99 (0.94)	5.00 (0.99)
	Intervention	4.77 (1.03)	4.99 (0.99)	4.93 (1.01)	5.05 (0.93)
Optimism	Control	4.93 (1.01)	5.05 (0.99)	5.13 (0.94)	5.22 (0.96)
	Intervention	4.95 (1.06)	5.13 (1.03)	5.09 (1.07)	5.11 (0.94)
Future time perspective	Control	5.77 (1.04)	5.74 (1.00)	5.74 (1.00)	5.82 (0.97)
	Intervention	5.92 (0.88)	5.90 (0.92)	5.86 (0.89)	5.99 (0.75)
Resilience	Control	7.36 (1.00)	7.36 (1.03)	7.47 (1.04)	7.60 (0.95)
	Intervention	7.41 (0.94)	7.49 (0.96)	7.53 (0.92)	7.60 (0.82)
Social connected	Control	2.92 (0.98)	3.09 (0.96)	3.16 (1.02)	3.27 (1.01)
	Intervention	2.94 (1.03)	3.15 (1.00)	3.21 (0.96)	3.27 (0.96)
Gratitude	Control	4.74 (0.99)	4.83 (1.03)	4.92 (0.92)	4.95 (1.01)
	Intervention	4.80 (1.09)	4.95 (1.00)	4.89 (0.98)	5.00 (0.94)
Condom intention	Control	3.24 (1.03)	3.24 (1.02)	3.29 (1.02)	3.46 (0.94)
	Intervention	3.19 (1.08)	3.41 (0.96)	3.39 (1.06)	3.43 (0.94)
Safe sex behavior	Control	2.80 (1.00)	2.87 (1.04)	2.90 (1.07)	2.98 (1.04)
	Intervention	2.79 (1.09)	3.03 (1.01)	2.98 (1.13)	3.00 (1.08)
Self-efficacy substance refusal	Control	3.29 (1.05)	2.91 (0.88)	3.04 (0.79)	3.07 (0.82)
	Intervention	3.35 (0.94)	2.93 (0.92)	3.02 (0.78)	3.05 (0.75)
Self-efficacy safe sex	Control	5.32 (0.95)	5.14 (1.16)	5.32 (1.05)	5.35 (1.01)
	Intervention	5.27 (1.13)	5.28 (1.03)	5.29 (1.07)	5.34 (0.96)
Life satisfaction	Control	2.41 (0.98)	2.59 (1.03)	2.87 (0.99)	2.97 (0.99)
	Intervention	2.44 (1.05)	2.68 (1.00)	2.61 (1.07)	2.89 (0.93)

estimates across alternative model specifications. Although they are consistent in terms of the direction and magnitude of effects that we report here, statistical significance varies with model specification. As always, we recommend interpreting statistical significance with caution.

Results

Demographics of sample

The total sample was predominantly male (55%) and heterosexual (69.9%; 19.6% bisexual; 5.5% lesbian; 5.1% gay). Moreover, 3% of the total sample also reported their gender identity as transgender. The mean age was 21 (standard deviation [SD] = 1.8) years, and 85% were HIV-negative (1% positive, 14% unknown). There were statistically significant differences between participants in the two geographic sites by race/ethnicity but not by age, sex, or percentage who had finished high school. There were significantly more Black YEH in Ohio than in Texas ($n = 223$, 65.8% vs. $n = 82$, 32.4%; $\chi^2(1) = 63.26$, $p < .001$) and more Latinx YEH in Texas than in Ohio ($n = 84$, 33.1% vs. $n = 29$, 8.6%; $\chi^2(1) = 54.75$, $p < .001$). Participants in Texas had been away from their families significantly longer than those in Ohio ($t(514.38) = -3.27$, $p = .001$), and significantly more YEH in Ohio than those in Texas worked full-time ($\chi^2(1) = 9.08$, $p = .003$).

Overall, the session attendance rate average was 4.5 sessions (SD = 2.2) in Ohio and 3.79 sessions (SD = 2.5) in Texas. YEH assigned to the intervention in Ohio ($n = 170$) completed significantly more sessions than YEH assigned to the intervention ($n = 128$) in Texas ($t(257.65) = 2.67$, $p = .001$). In Ohio, 105 youth completed all six sessions of the intervention (61.8%) over an average of 3.0 months (SD = 1.5), whereas in Texas, 69 youth completed all six sessions (54%) over an average of 2.25 months (SD = 1.35). YEH in Ohio attended more sessions on average, but they took significantly longer to complete all six sessions ($t(155) = -3.43$, $p = .001$).

Effects of the intervention

The first hypothesis, which stated that participants receiving the intervention would score higher on all postintervention measures than on the same measures completed as pretests, was partially supported. Table 2 shows the change from baseline (for intervention participants who completed the pretest only) in each of the outcome scores for each subsequent measurement occasion, with standard errors in parentheses, as estimated from the multilevel model. The scores for all theoretical variables except FTP, resilience, gratitude, and the two self-efficacy variables (i.e., for safe sex and for substance use refusal) increased significantly from baseline to Time 1, immediately upon completion of the intervention. At Time 2, this pattern continued, but scores on gratitude increased significantly ($p < .05$) from pretesting. At Time 3, the same pattern continued with significant increases in scores on gratitude and resilience ($p < .01$).

The second hypothesis, which stated that participants who received the intervention would score higher on all theoretical

Table 5

Pretest effects on outcome measures at three post-test time points

Outcome	Time		
	1	2	3
Hope	0.14 (0.07)*	0.18 (0.07)**	0.06 (0.07)
Optimism	0.06 (0.07)	0.09 (0.07)	-0.01 (0.07)
Future time perspective	0.12 (0.07)***	0.18 (0.07)*	0.10 (0.07)
Resilience	0.13 (0.07)*	0.16 (0.07)*	0.11 (0.07)
Social connectedness	0.01 (0.07)	0.04 (0.07)	-0.11 (0.07)
Gratitude	0.01 (0.07)	0.04 (0.07)	-0.07 (0.07)
Condom intention	0.07 (0.07)	0.10 (0.07)	-0.03 (0.07)
Self-efficacy for safe sex	0.08 (0.07)	0.07 (0.07)	0.04 (0.07)
Safe sex behaviors	0.05 (0.07)	0.12 (0.07)	-0.05 (0.07)
Self-efficacy substance refusal	0.16 (0.07)*	0.11 (0.07)	0.14(0.07)*
Life satisfaction	0.18 (0.07)**	0.17 (0.07)*	0.05 (0.07)

* $p < .05$; ** $p < .01$; *** $p < .001$.

variables than participants who received SAU, was also partially supported. Table 3 shows the model-estimated average differences between intervention and control participants, at baseline and at the 3 outcome time points, on the 11 theoretical measures and their averages. There was no evidence of effects at baseline, suggesting that participants randomized to different intervention arms were indeed comparable. At Time 1, estimated mean scores were higher in the intervention group than in the control group for all theoretical measures; these differences were statistically significant for hope ($p < .05$), optimism ($p < .05$), FTP ($p < .05$), social connectedness ($p < .05$), gratitude ($p < .05$), condom intention ($p < .05$), safe sex behavior ($p < .01$), and life satisfaction ($p < .05$); at Time 2, mean life satisfaction scores were significantly lower for those in the intervention group than in the control group ($p < .01$). At Time 3, none of the estimated differences between the intervention and control groups was statistically significant. Table 4 shows the sample sizes and outcome score averages for each measurement occasion by both control and intervention conditions.

The third hypothesis, which stated that participants who completed the pretest would score higher on all post-tests than those who did not complete pretests, was also partially supported. Shown in Table 5, the pretest had a statistically significant effect on Time 1 outcomes of hope ($p < .05$), resilience ($p < .05$), substance refusal self-efficacy ($p < .05$), and life satisfaction immediately following the intervention ($p < .01$); at Time 2 on outcomes of hope ($p < .01$), FTP ($p < .05$), resilience ($p < .05$), and life satisfaction ($p < .05$). At Time 3, the pretest showed significant effects on the outcome of substance refusal self-efficacy ($p < .05$) only.

Discussion

This is one of the first brief interventions developed for YEH that focused on developing positive motivations to engage in health-promoting behaviors. Findings provided partial support for all three hypotheses tested. Findings showed that participants who received the intervention improved their scores on the majority of variables that were the focus of this intervention and differences from baseline were apparent at all three data collection points following the intervention, but these changes were not sustained over time. The areas in which improvements were not seen at any of the three time points included FTP, and the two measures of self-efficacy (i.e., for substance refusal and for negotiating safe sex). A possible reason that we did not find significance in FTP may be its conceptual overlap with measures of hope and optimism; furthermore, this measure was not developed specifically for youth [26]. These findings suggest that a longer or more robust intervention may be required to support YEH's self-confidence for future behaviors. The specific behaviors of refusing substances and negotiating for safer sex are of paramount importance in this population. Behavioral support for building confidence was possibly not strong enough in the intervention tested here and warrants further investigation.

A primary goal of the current study was to encourage safer sex behaviors and build substance refusal skills, but all youth who participated were currently in a homeless crisis, with a focus on present survival. Once meetings with the interventionist ended, the positive reinforcement and strength-based focus may have become overshadowed by a street culture characterized by high rates of peer drug use, condom-less sex, as well as victimization and violence. Timing of this intervention may be essential for

understanding its impact. That is, administration of this intervention after the homeless crisis resolves would likely result in long-term outcomes. The challenge for the field of prevention in general is how to affect behavior during a time when survival becomes an individual's primary focus. Indeed, many researchers lament the limited long-term impacts of HIV prevention and substance use outcomes among those currently in a homeless crisis [11,13]. Much work remains to be done to determine how to help youth in the midst of a homeless crisis to maintain hope and intentions to remain safe and healthy.

Findings from this study lend partial support to the implementation of an individualized intervention based on concepts from positive psychology, specifically, enhancements of psychological capital. Traditionally, interventions for youth have focused on the prevention of problem behaviors; however, research on positive youth development has recognized that healthy adolescent development requires more than just the absence of problem behaviors [37]. Thus, this study contributes to the emerging focus on developing interventions that build on youths' strengths and optimism to prepare them for their future. Similarly, positive psychology interventions also focus on enhancing well-being and happiness rather than attempting to correct deficits or pathology [38]. Rather than focusing on the deficit or harm reduction models frequently used to frame interventions for YEH, we focused instead on emphasizing the development of positive attributes such as hope, optimism, and gratitude. We also focused on a distal outcome of life satisfaction. To our knowledge, this is the first study of homeless youth that has had this focus.

The findings also provide support for using the Solomon four-group design. That is, we found that pretesting had a statistically significant effect on specific outcomes at all three time points following the intervention. Overall, while these findings suggest that the intervention was able to impact intentions and behavior in the short-term, longer term change might require a longer intervention, booster sessions, or greater dosage. Next steps are to conduct implementation studies across multiple sites and agencies serving YEH. Because there were significant effects of pretesting, it would be prudent and cost-effective to use a post-test only design; threats to internal validity are the same as for the Solomon four-group design [21].

Strengths and limitations

The study was conducted in two geographically different states, Texas and Ohio, with very different DIC models, which is a strength. Recruiting from two different locations and using the same methods to collect data from both the intervention and control groups, decreased the bias that might otherwise have been associated with a sample from a single geographic area [39]. The sample size was relatively large and the follow-up rates never dipped below 85% in Ohio. In terms of the measures used, the Cronbach's alphas were all >0.71 across all measurement points. Another strength was testing a brief intervention based on concepts of psychological capital, a theoretical approach worthy of further study.

The sample, however, was limited to YEH in both locations who sought health and social services from DICs and thus may represent youth with more positive perceptions than YEH as a whole [40]. All data were self-report, which is another limitation of the study. The intrusion of a world-wide pandemic prior to the conclusion of the study clearly had some impact on the final

months of data collection and limited the total number of participants recruited and enrolled from the Texas sites.

Conclusion

Overall, the findings from this longitudinal intervention study lend support to conducting an individualized intervention to promote the development of positive psychological capital as well as attitudes and skills in practicing safe sex behaviors. Although the findings generally support a positive psychology approach, it is possible that improvement in self-efficacy requires resolution of crises associated with homelessness, beyond perceptions of the self. The homeless crisis presents significant stress and vulnerabilities beyond the individual's immediate control. Possibly, increasing providing boosters of the intervention and continuing to work with youth beyond their homeless crisis would maximize positive outcomes.

Acknowledgments

This study was supported by the National Institute of Child Health and Human Development/National Institutes of Health [R01HD083576 to Donna Lynn Rew, first author]. The authors wish to thank the participating drop-in centers, their staffs, and their clients in both Ohio and Texas.

References

- [1] National alliance to end homelessness. Youth. Available at: <https://endhomelessness.org/homelessness-in-america/who-experiences-homelessness/youth/>. Accessed August 20, 2021.
- [2] Werb D, Garfein R, Kerr T, et al. A socio-structural approach to preventing injection drug use initiation: Rationale for the PRIMER study. *Harm Reduction J* 2016;13:25.
- [3] Zhezri M, Mirzazadeh A, McFarland W, et al. Prevalence of substance use and associated risk factor among homeless youth in Iran: A cross-sectional study. *Child Youth Serv Rev* 2020;116:105070.
- [4] Brooks MJ, Marshal MP, McCauley HL, et al. The relationship between hope and adolescent likelihood to endorse substance use behaviors in a sample of marginalized youth. *Substance Use Misuse* 2016;51:1815–9.
- [5] Hayashi K, Daly-Grafstein B, Dong H, et al. The relationship between violence and engagement in drug dealing and sex work among street-involved youth. *Can J Public Health* 2016;107:e88–93.
- [6] Yoshioka-Maxwell A, Rice E. Exploring the relationship between foster care experiences and HIV risk behaviors among a sample of homeless former foster youth. *AIDS Behav* 2019;23:792–801.
- [7] Turnbull J, Muckle W, Masters C, et al. Homelessness and health. *Can Med Assoc J* 2007;177:1065–6.
- [8] Rew L, Slesnick N, Johnson K, Aguilar R, Cengiz A. Positive attributes and life satisfaction in homeless youth. *Child Youth Serv Rev* 2019;100:1–8.
- [9] Gwadz M, Freeman R, Leonard NR, et al. Understanding organizations serving runaway and homeless youth: A multi-setting, multi-perspective qualitative exploration. *Child Adolesc Soc Work J* 2019;36:201–17.
- [10] Congressional Research Service (CSR). Runaway and homeless youth: Demographics and programs. CRS Report. Available at: <https://crsreports.congress.gov>. Accessed October 26, 2021.
- [11] Nyamathi A, Branson C, Kennedy B, et al. Impact of nursing intervention on decreasing substances among homeless youth. *Am J Addict* 2012;21:558–65.
- [12] Slesnick N, Kang MJ. Impact of an integrated treatment on HIV risk behavior among homeless youth: A randomized controlled trial. *J Behav Med* 2008;31:45–59.
- [13] Baer JS, Garrett SB, Beadnell B, et al. Brief motivational intervention with homeless adolescents: Evaluation effects on substance use and service utilization. *Psychol Addict Behav* 2007;21:582–6.
- [14] Aparicio EM, Phillips DR, Okimoto T, et al. Youth and provider perspectives of Wahine Talk: A holistic sexual health and pregnancy prevention program developed with and for homeless youth. *Child Youth Serv Rev* 2018;93:467–73.
- [15] Calderon Y, Cowan E, Leu C-S, et al. A human immunodeficiency virus posttest video to increase condom use among adolescent emergency department patients. *J Adolesc Health* 2012;53:78–84.
- [16] Bender KA, DePrince A, Begun S, et al. Enhancing risk detection among homeless youth: A randomized clinical trial of a promising pilot intervention. *J Interpersonal Violence* 2018;33:2945–67.
- [17] Thompson RG Jr, Elliott JC, Hu M-C, et al. Short-term effects of a brief intervention to reduce alcohol use and sexual risk among homeless young adults: Results from a randomized controlled trial. *Addict Res Theor* 2017;25:24–31.
- [18] Wang JZ, Mott S, Magwood O, et al. The impact of interventions for youth experiencing homelessness on housing, mental health, substance use, and family cohesion: A systematic review. *BMC Public Health* 2019;19:1528.
- [19] Xiang X. A review of interventions for substance use among homeless youth. *Res Soc Work Pract* 2013;23:34–45.
- [20] Braver MW, Braver SL. Statistical treatment of the Solomon four-group design: A meta-analytic approach. *Psychol Bull* 1988;104:150–4.
- [21] Campbell DT, Stanley JC. *Experimental and quasi-experimental designs for research*. Boston: Houghton Mifflin Company; 1963.
- [22] Luthans F, Youssef CM, Avolio BJ. *Psychological capital: Developing the human competitive edge*. Oxford: Oxford University Press; 2007.
- [23] Snyder CR, Lopez SJ, Shorey HS, et al. Hope theory, measurements, and applications to school psychology. *Sch Psychol Quart* 2003;18:122–39.
- [24] Scheier MF, Carver CS. Optimism, coping, and health: Assessment and implications of generalized outcome expectancies. *Health Psychol* 1985;4:219–47.
- [25] Heimberg LK. *The measurement of future time perspective*. Nashville, TN: Vanderbilt University; 1963. Unpublished Doctoral thesis.
- [26] Wagnild GM, Young HM. Development and psychometric evaluation of the resilience scale. *J Nurs Meas* 1993;1:165–78.
- [27] Blum R, Harris LJ, Resnick MD, Rosenwinkel K. *Technical report on the adolescent health survey*. Minneapolis, MN: University of Minnesota; 1989.
- [28] McCullough ME, Emmons RA, Tsang JA. The grateful disposition: A conceptual and empirical typology. *J Personal Soc Psychol* 2002;82:112–27.
- [29] Jemmott LS, Jemmott JB. Applying the theory of reasoned action to AIDS risk behavior: Condom use intentions among black women. *Nurs Res* 1991;40:228–34.
- [30] Dilorio C, Parsons M, Lehr S, et al. Measurement of safe sex behavior in adolescents and young adults. *Nurs Res* 1992;41:203–8.
- [31] Hanna KM. An adolescent and young adult condom self-efficacy scale. *J Ped Nurs* 1999;14:59–66.
- [32] Pavot W, Diener E. Review of the satisfaction with life scale. *Psychol Assess* 1993;5:164–72.
- [33] Baldwin SA, Imel ZE, Braithwaite SR, Atkins DC. Analyzing multiple outcomes in clinical research using multivariate multilevel models. *J Consult Clin Psychol* 2014;82:920.
- [34] Gelman A, Hill J, Yajima M. Why we (usually) don't have to worry about multiple comparisons. *J Res Educ Effectiveness* 2012;5:189–211.
- [35] Gelman A, Hill J. *Data analysis using regression and multilevel/hierarchical models*. Cambridge, England: Cambridge University Press; 2006.
- [36] R Core Team. *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing; 2020. Available at: <https://www.R-project.org/>. Accessed November 10, 2021.
- [37] Roth JL, Brooks-Gunn J. Evaluating youth development programs: Progress and promise. *Appl Develop Sci* 2016;20:188–202.
- [38] Sin NL, Lyubomirsky S. Enhancing well-being and alleviating depressive symptoms with positive psychology interventions: A practice-friendly meta-analysis. *J Clin Psychol* 2009;65:467–87.
- [39] Golinelli D, Tucker JS, Ryan GW, Wenzel SL. Strategies for obtaining probability samples of homeless youth. *Field Methods* 2015;27:131–43.
- [40] Tucker JS, Pedersen ER, Parast L, Klein DJ. Factors associated with drop-in center utilization among unaccompanied youth experiencing homelessness. *Child Youth Serv Rev* 2018;91:347–54.