TBM

BRIEF REPORT

Brief report of a tablet-delivered psychosocial intervention for men with advanced prostate cancer: Acceptability and efficacy by race

Laura C. Bouchard,[1] Betina Yanez,[1] Jason R. Dahn,[2] Sarah C. Flury,[3] Kent T. Perry,[3] David C. Mohr,[4] Frank J. Penedo[5]

[1]Department of Medical Social Sciences, Northwestern University Feinberg School of Medicine, Chicago, IL, USA
[2]Mental Health and Behavioral Sciences Service, Miami Veterans Affairs Healthcare System, Miami, FL, USA
[3]Department of Urology, Robert H. Lurie Comprehensive Cancer Center, Northwestern University Feinberg School of Medicine, Chicago, IL, USA
[4]Department of Preventive Medicine, Northwestern University Feinberg School of Medicine, Chicago, IL, USA
[5]Departments of Psychology and Medicine, Sylvester Comprehensive Cancer Center, University of Miami, Miami, FL, USA

Correspondence to: F Penedo, frank.penedo@miami.edu

Cite this as: *TBM* 2019;9:629–637
doi: 10.1093/tbm/iby089

Abstract

Relative to non-Hispanic whites (NHW), black men are disproportionately affected by prostate cancer (PC) incidence, have poorer PC outcomes, and report greater compromises in health-related quality of life. Despite these challenges, black men are underrepresented in psychosocial cancer research, possibly due to limited access to supportive oncology programs. The purpose of this article is to examine the acceptability and efficacy for reducing disease-specific distress of a tablet-delivered psychosocial intervention for older men with advanced PC (APC) and explore differences by race. Men with APC ($N = 192$, 37.5% black, age $M = 68.84$ years) were randomized to 10-week Cognitive Behavioral Stress Management (CBSM) or attention-control Health Promotion (HP), both delivered via tablets. Assessments occurred at baseline in person, weekly during the 10-week program via tablets, and at 6 and 12 months in person. Weekly session evaluations and postprogram exit surveys assessed acceptability. Efficacy was assessed with a measure of PC-anxiety validated with racially diverse PC patients using linear mixed effects modeling. Study retention and group attendance did not differ by race. CBSM and HP were both acceptable among older APC patients. Black men rated both conditions more favorably than NHW men. Men in CBSM (vs. HP) reported greater reductions in PC-anxiety at 6 months (not sustained at 12 months). Black men in CBSM reported greater decreases in PC-anxiety over time compared with all other groups. Tablet-delivered CBSM and HP were acceptable for black and NHW APC patients, although black men rated both conditions more favorably. Black men reported a unique intervention benefit related to reduced disease-specific distress.

Keywords

Prostate cancer, Psychosocial intervention, Black men, Disparities, E-health

Implications

Practice: Technology-assisted group Cognitive Behavioral Stress Management (CBSM) is feasible and acceptable among older black and non-Hispanic white men with advanced prostate cancer, and it improves prostate cancer-related anxiety particularly among black patients.

Policy: Policymakers who want to improve the reach of supportive oncology programs among hard-to-reach patient populations should consider supporting health care legislation that includes funding allocations to reimburse for evidence-based interventions delivered through web-based technologies.

Research: Future research should examine additional effects of technology-assisted CBSM by race on outcomes such as health-related quality of life and symptom burden.

INTRODUCTION

Prostate cancer (PC) is the most common cancer among men in the USA [1]. Due to screening and treatment advances, the 5-year survival rate for early-stage disease approximates 100% [1]. Yet despite medical advances, a PC diagnosis is distressing. Elevated distress is reported in 16–31% of PC patients, and approximately 6% of patients meet criteria for a psychiatric disorder (e.g., mood disorders) [2,3]. PC disproportionately affects black men, with 70% higher incidence than non-Hispanic white (NHW) men [4]. Black men are also more likely to be diagnosed with metastatic disease (stage IV) [5] for which the 5-year survival rate drops to 30% [1], and black men are 2.4 times more likely to die from PC compared with NHW men [3].

Given these disparities, one might expect greater distress among black PC patients. Yet, research on the psychosocial needs of black PC patients is limited, and black men are broadly underrepresented in psychosocial PC research. Of the available studies, evidence of psychosocial disparities is mixed. Two studies found lower health-related quality of life (HRQoL) in black PC patients relative to NHW patients [6,7], whereas another study found evidence of protective resiliency among black PC patients [8]. More research is needed to elucidate these findings.

Black men face unique barriers limiting their involvement in clinical trials such as limited awareness of trials and lower acceptance into trials [9,10]. Other factors include unfamiliarity or mistrust of

health care systems, transportation issues, financial limitations, and caretaking responsibilities (e.g., elders, children, grandchildren). Older age and lower socioeconomic status (SES) are barriers as well, as they frequently relate to study design barriers (e.g., age restrictions, functional status) [9]. Thus, study design is a key factor in reducing barriers to recruitment and retention of hard-to-reach black men in psychosocial cancer research.

Our team has adapted a psychosocial intervention (Cognitive Behavioral Stress Management [CBSM]) [11] for older men with advanced PC (APC; stages III–IV), and we have shown preliminary feasibility and acceptability in a small sample [12]. In the study design, we made efforts to reduce barriers to recruiting and retaining minority men (i.e., black men), including administration of the intervention via tablets. The main outcomes of the larger trial are improved HRQoL and reduced symptom burden (to be reported elsewhere). In this brief report, we examined participant engagement and acceptability of tablet-delivered CBSM and an attention-matched Health Promotion (HP) control in our full sample of men with APC, and we explored differences by race (black vs. NHW). We hypothesized that both conditions would be acceptable, and there would be no differences by race. We conducted exploratory analyses of the intervention's efficacy for reducing disease-specific distress during a longer follow-up than previously reported [12], and we explored differences by race.

MATERIALS AND METHODS

Participants and procedures

We recruited men with APC from two large Midwestern academic medical centers and a Veterans Affairs (VA) medical center from 2013 to 2016. Eligible men were ≥50 years old, fluent in English, diagnosed with APC, and had undergone androgen deprivation therapy (ADT). Participants were excluded if they had a history of surgery or chemotherapy in the past 6 months, a history of nonskin cancer, prior inpatient psychiatric treatment, or current cognitive impairment. All participants gave informed consent (approved by the IRB at each institution). At baseline (T1), participants reported on demographics and completed psychosocial assessments in person, and clinical information was obtained from medical records. Participants were randomized (1:1) to CBSM or HP (four to six men per condition), and groups were stratified by disease status (advanced vs. metastatic disease). Follow-up assessments occurred at 6 (T2) and 12 months (T3) post-baseline. Compensation was provided for each assessment ($100). To accommodate minority participants and patients with advanced disease, we provided (a) extensive education about the study's purpose and goals, (b) transportation for in-person assessments, (c) flexible schedules for group sessions, and (d) training for using the study's technology.

Study conditions

CBSM and HP were group-based, manualized, and delivered once weekly over 10 weeks via a HIPAA-compliant, web-based platform on a study-provided tablet (Samsung Galaxy 2 with 4G connectivity). Group facilitators were master's level therapists who completed an in-person facilitator training. During sessions, facilitators communicated with participants and displayed didactic content via WebEx video conferencing software. In cases of connectivity issues (e.g., tablet not charged), participants were able to join the session via telephone. Between sessions, participants reviewed didactic material (e.g., session content) and expert videos (e.g., symptoms of ADT discussed by a urologist) and completed weekly assessments on the program website. Sessions were recorded and reviewed in weekly supervision with licensed clinical psychologists trained in both protocols to ensure intervention fidelity.

CBSM treatment condition

CBSM integrates cognitive-behavioral stress and self-management skills (e.g., cognitive restructuring) with relaxation skills training (e.g., deep breathing) to improve HRQoL and reduce symptoms [11]. We adapted CBSM for men with APC by including disease-relevant examples and didactics (e.g., hot flashes) and providing additional skills relevant for men with APC (e.g., existential concerns). See Table 1 for a brief outline of session content by week and the linkage with APC concerns. Sessions were approximately 90 min. Each session started with practicing a new relaxation technique (30 min) followed by discussion of and practice with stress management techniques (60 min).

Attention-control HP condition

HP incorporates general health and APC-specific information and does not include any CBSM techniques. Each session was approximately 60 min. Topics included understanding APC, remaining physically active, and eating healthy based on national nutrition guidelines [13,14].

Measures

Comorbidities

Medical comorbidities were patient reported and combined into a single, weighted index score using the weighting scheme from the Charlson Comorbidity Index [15] such that higher scores indicate more severe comorbidities.

Participant engagement

We tracked study retention and attendance, and the following rates were deemed acceptable based

Table 1 | Overview of CBSM content by week and linkage with APC concerns

Week	Relaxation technique	Stress management topic	Linkage with APC concern
1	Deep breathing	My health, stress, and awareness	Disease and treatment-related concerns
2	Deep breathing	Stress and awareness	Awareness of thoughts, feelings, and behaviors
3	7-Muscle PMR	Automatic thoughts, distortions, and thought restructuring	Bodily changes, impact of symptoms, fear of progression/death, negative outlook
4	7-Muscle PMR	Cognitive restructuring	Self-image as a cancer survivor, adjusting expectations for self and others
5	Deep breathing and 4-muscle PMR	Effective coping skills	Bodily changes, redefining intimacy, coping with symptoms
6	Deep breathing and 4-muscle PMR	Sexuality and intimacy	Loss of sexual desire and functioning, redefining sexual intimacy, negotiating intimacy and alternatives
7	Guided imagery	Social support	Loss of intimacy, interpersonal conflict, avoiding conversations about symptoms, disease progression/death
8	Guided imagery	Anger management	Interpersonal conflict, frustration with health care
9	Meditation	Assertiveness	Doctor–patient and intimate relationships, expressing needs adaptively, asking others for help
10	Meditation	Acceptance and program review	Generalizing skills to daily life, redefining roles

APC advanced prostate cancer; *CBSM* Cognitive Behavioral Stress Management; *PMR* progressive muscle relaxation.

on prior studies of advanced or metastatic cancer patients: 70% retention and 70% average session attendance [16,17].

Acceptability

Participants completed weekly evaluations (5–7 min) to rate their confidence in using each session's information/skills and to report on group dynamics with responses from 1 (not at all) to 5 (very much). After the 10-week program, participants completed an exit survey to rate how much they liked the information in the study and the weekly groups with responses from 1 (not at all) to 4 (a lot).

Efficacy

The 18-item Memorial Anxiety Scale for PC (MAX-PC) assesses PC-related anxiety [18] and has been validated with black and APC patients [19,20]. Items ask how frequently statements about PC were true over the past week (e.g., "I thought about PC even when I didn't mean to") on a Likert scale from 0 (not at all) to 3 (often). Items responses were summed, and greater scores indicate greater PC-anxiety. Internal consistency coefficients were acceptable (α ranged from .68 to .77).

Analyses

We used IBM SPSS Version 24. Power calculations were based on our prior study in APC. We projected that with 150 participants retained at T3 and a .05 alpha level, we would have a power of 0.86 for detecting intervention effects on HRQoL. Participant engagement and acceptability were assessed with frequency counts and descriptive statistics. We evaluated differences by condition and race with *t*-tests and chi-square tests. We analyzed MAX-PC for normality and Winsorized outliers of >3 *SD* from the mean [21]. We used linear mixed effects modeling to assess three models of change in MAX-PC scores over time controlling for age, comorbidities [22], and baseline MAX-PC scores. Linear mixed effects modeling accounts for an individual's trajectory of scores and controls for correlations between repeated assessments. All data available were used to estimate models, so that participants were included at each time point for which they provided data (as opposed to listwise deletion). In model 1, we assessed the effects of time, condition (CBSM vs. HP), and the interaction of time and condition on MAX-PC scores. In models 2 and 3, we focused on black (model 2) and NHW men (model 3) separately to assess the effects of time, condition (CBSM vs. HP), and the interaction of time and condition on MAX-PC scores. We adjusted pairwise comparisons with Sidak correction for multiple comparisons [23].

RESULTS

Sample characteristics

Participants were 192 men with APC (37.5% black men) an average of 68.84 years old (*SD* = 8.87; Table 2). There were no differences between men randomized to CBSM and HP on demographic or medical variables, but baseline MAX-PC scores were higher in CBSM. There were demographic differences between NHW and black men across study conditions; black men reported lower SES (e.g., lower education and income) compared to NHW men in this sample. Black men were also more likely to be recruited from the VA medical center than NHW men. At baseline, there was no difference in MAX-PC scores between NHW and black men, and scores were similar to those reported in other samples of APC [19].

Participant engagement: retention and attendance

See Fig. 1 for CONSORT diagram with study flow. Retention was acceptable and similar for CBSM

Table 2 | Means, standard deviations, and frequencies of demographic and medical characteristics by study condition and race

	Differences by condition			Differences by race		
	CBSM	HP		NHW	Black	
	(*n* = 95)	(*n* = 97)	Statistic	(*n* = 109)	(*n* = 72)	Statistic
Age[a], year; mean (*SD*)	68.81 (8.54)	68.87 (9.23)	$t(190) = -0.04$	68.89 (8.50)	69.49 (9.37)	$t(179) = -0.44$
Time since diagnosis, year; mean (*SD*)	4.36 (5.16)	5.05 (5.41)	$t(183) = -0.89$	4.75 (5.53)	4.82 (5.15)	$t(172) = -0.08$
Recruitment site; *n* (%)			$\chi^2(3) = 5.55$			$\chi^2(5) = 42.98$***
Academic medical center 1	58 (61.1)	53 (55.2)		79 (73.1)	26 (36.1)	
VA medical center	18 (18.9)	24 (25.0)		7 (6.5)	33 (45.8)	
Academic medical center 2	19 (20.0)	15 (15.6)		18 (16.7)	13 (18.1)	
Other	0 (0.0)	4 (4.1)		4 (3.7)	0 (0.0)	
Race; *n* (%)			$\chi^2(4) = 2.38$			
White	54 (56.8)	55 (56.7)		—	—	
Black	37 (38.9)	35 (36.1)		—	—	
Hispanic	3 (3.2)	3 (3.1)		—	—	
Asian	1 (1.1)	2 (2.1)		—	—	
Multiracial	0 (0.0)	2 (2.1)		—	—	
Employment status; *n* (%)			$\chi^2(3) = 3.53$			$\chi^2(3) = 5.87$
Full time	22 (23.4)	30 (30.9)		32 (29.4)	14 (19.7)	
Part-time	9 (9.6)	13 (13.4)		14 (12.8)	6 (8.5)	
Retired	58 (61.7)	52 (53.6)		61 (56.0)	46 (64.8)	
Unemployed	5 (5.3)	2 (2.1)		2 (1.8)	5 (7.0)	
Family income < $35,000; *n* (%)	34 (38.6)	35 (39.8)	$\chi^2(1) = 0.02$	21 (21.2)	44 (66.7)	$\chi^2(1) = 34.27$***
College or graduate degree; *n* (%)	64 (68.8)	64 (67.4)	$\chi^2(1) = 0.05$	91 (85.0)	29 (40.8)	$\chi^2(1) = 37.96$***
Married/partnered; *n* (%)	67 (70.5)	61 (62.9)	$\chi^2(1) = 1.26$	88 (80.7)	33 (45.8)	$\chi^2(1) = 23.83$***
Prostate cancer stage III; *n* (%)	38 (44.7)	32 (36.4)	$\chi^2(1) = 1.25$	44 (44.0)	20 (32.3)	$\chi^2(1) = 2.21$
T1 MAX-PC score; mean (*SD*)	13.07 (11.63)	9.34 (9.35)	$t(173) = 2.34$*	11.71 (10.65)	10.93 (11.11)	$t(163) = 0.46$

CBSM Cognitive Behavioral Stress Management; *HP* Health Promotion; *MAX-PC* Memorial Anxiety Scale for Prostate Cancer; *NHW* = non-Hispanic white; *VA* Veterans Affairs.
[a]Range for full sample was 51–94 years.
*$p < .05$; ***$p < .001$.

and HP (>70%) and did not differ by race in either condition (ps > .05). Group attendance was acceptable and similar for CBSM (M = 7.47, SD = 3.09) and HP (M = 7.90, SD = 2.86; $p > .05$) and did not differ by race in either condition (ps > .05; Table 3). Two thirds (67%) of the participants attended eight or more sessions. There were 24 adverse events during the study (6 hospitalizations, 17 deaths including men lost to follow up and after the T3 assessment, and 1 new cancer diagnosis). All adverse events were unrelated to the present study's treatment.

Acceptability: weekly evaluations and exit surveys

In CBSM, weekly group ratings did not differ by race (NHW vs. black; Table 3). In HP, black men (vs. NHW men) rated the weekly information as more useful (medium effect). Average exit survey responses were favorable and similar for CBSM (M = 3.53, SD = 0.55) and HP (M = 3.65, SD = 0.41; $p > .05$). In CBSM, black men reported significantly greater acceptability of all CBSM components (medium-large effects; Table 3). In HP, black men reported significantly or marginally greater acceptability all HP components (small-medium effects).

Efficacy: PC-anxiety

Model 1 assessed the effects of time, condition (CBSM vs. HP), and the interaction of time and condition on MAX-PC scores in the total sample (see Fig. 2a). There was a significant interaction of time and condition on MAX-PC scores ($F[2, 299] = 3.41$, $p = .034$). From T1 to T2, there was a more negative slope in CBSM vs. HP ($b = -2.69$, $SE = 1.05$, $p = .011$), but this was not sustained at T3 ($p > .05$). Pairwise comparisons showed that, within CBSM, MAX-PC scores were significantly lower at T2 versus T1 ($p < .001$), and this was maintained at T3 ($p = .011$). Within HP, MAX-PC scores did not change from T1 to T2 or T1 to T3 (ps > .05). Men in CBSM versus HP had lower MAX-PC scores at T2 ($p = .025$), but not T3 ($p > .05$). Across time, men in both conditions reported MAX-PC scores that remained within 1 SD of scores reported in other samples of APC [20].

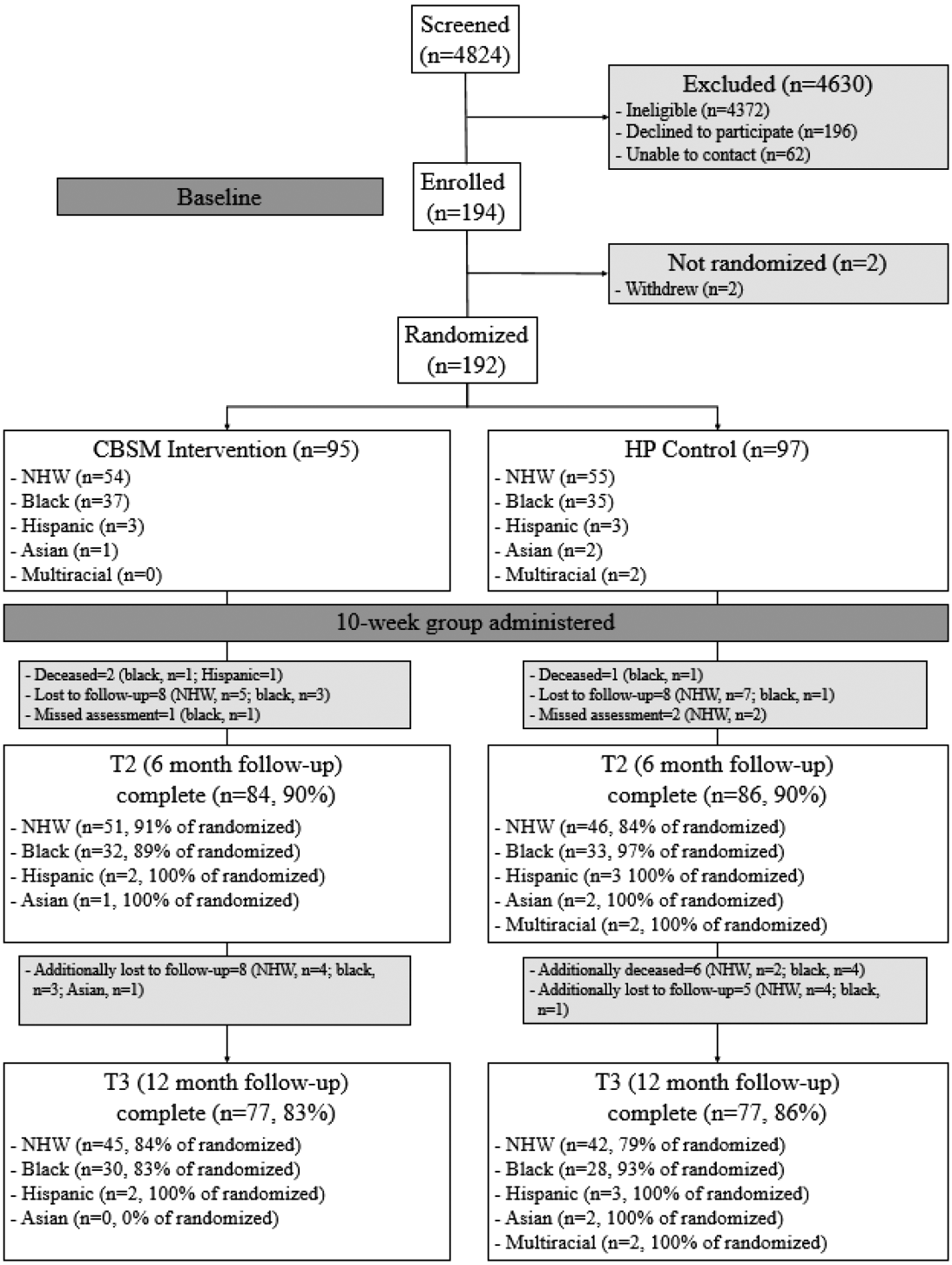

Fig 1 | CONSORT diagram with study flow and retention by study condition and race/ethnicity.

Model two focused on black participants only and assessed the effects of time, condition (CBSM vs. HP), and the interaction of time and condition on MAX-PC scores (see Fig. 2b). There was a significant interaction of time and condition on MAX-PC scores within black participants (F[2, 160] = 3.93, p = .022). From T1 to T2, there was a more negative slope in black CBSM participants versus black HP participants (b = −4.31, SE = 1.90, p = .025), which was sustained at T3 (b = −4.92, SE = 1.99, p = .014). Pairwise comparisons showed that, within black CBSM participants, MAX-PC scores were significantly lower at T2 versus T1 (p < .001), and this was maintained at T3 (p < .001). For black participants in the HP condition, MAX-PC scores did not change from T1 to T2 or T1 to T3 (ps > .05). Black men in CBSM had marginally lower MAX-PC scores than black men in HP at T2 (p = .098) and at T3 (p = .051). Across time,

Table 3 | Means and standard deviations of weekly group attendance, weekly session evaluation responses, and exit survey responses presented by race within each condition

	CBSM				HP			
	NHW (n = 54)	Black (n = 37)	Statistic	Cohen's d	NHW (n = 55)	Black (n = 35)	Statistic	Cohen's d
Weekly group attendance								
Number of group sessions attended	7.52 (3.06)	7.35 (3.23)	$t(89) = 0.25$	0.05	7.83 (3.07)	7.80 (2.60)	$t(91) = 0.04$	0.01
Weekly session evaluations								
How confident are you with the new information presented today?	4.05 (0.48)	3.90 (0.73)	$t(76) = 1.12$	0.24	3.81 (0.69)	4.03 (0.60)	$t(79) = -1.50$	0.34
How useful was the information you were presented today?	3.85 (0.70)	3.74 (0.91)	$t(77) = 0.56$	0.12	3.68 (0.84)	4.14 (0.56)	$t(78) = -2.70$**	0.64
To what extent were you able to discuss your feelings and concerns openly with the group?	3.91 (0.78)	3.63 (1.20)	$t(76) = 1.25$	0.28	NA	NA	—	—
How much do you feel you were heard by the group?	4.01 (0.72)	3.79 (0.95)	$t(75) = 1.18$	0.26	NA	NA	—	—
How much do you feel the members of the group respected and considered your feelings and concerns?	4.16 (0.62)	4.02 (0.94)	$t(74) = 0.81$	0.18	NA	NA	—	—
Exit surveys								
How much did you like the information presented in the weekly online reviews?	3.33 (0.76)	3.88 (0.33)	$t(64) = -3.52$***	0.94	3.49 (0.65)	3.80 (0.41)	$t(65) = -2.30$*	0.57
How much did you like the information presented in the online expert videos?	3.41 (0.57)	3.76 (0.44)	$t(48) = -2.35$*	0.69	3.38 (0.67)	3.68 (0.48)	$t(41) = -1.70$†	0.51
How much did you like the weekly online groups?	3.50 (0.78)	3.88 (0.33)	$t(64) = -2.37$*	0.63	3.64 (0.67)	3.87 (0.35)	$t(67) = -1.68$†	0.43
How much did you like the online relaxation exercises?	3.24 (0.94)	3.77 (0.43)	$t(62) = -2.69$**	0.73	NA	NA	—	—

Weekly session evaluation responses were averaged across 10 weeks; possible scores for each weekly assessment question were 1–5; possible scores for each exit survey question were 1–4. *CBSM* Cognitive Behavioral Stress Management; *HP* Health Promotion; *NA* not applicable; *NHW* non-Hispanic white.

†$p < .10$; *$p < .05$; **$p < .010$; ***$p < .001$.

black men in CBSM at T1 and black men in HP at all time points reported MAX-PC scores that remained within 1 *SD* of scores reported in other samples of APC. Black men in CBSM reported lower MAX-PC scores at T2 and T3 compared with other samples of APC [20].

Model 3 focused on NHW participants only and assessed the effects of time, condition (CBSM vs. HP), and the interaction of time and condition on MAX-PC scores (see Fig. 2c). There was no interaction of time and condition on MAX-PC scores within white participants ($p > .05$). There was a marginally significant main effect of time ($F[2, 165] = 2.68$, $p = .072$), with white men reporting marginally lower MAX-PC scores at T3 (vs. T1) regardless of study condition ($b = -1.72$, $SE = 0.86$, $p = .047$). There was not a significant main effect of condition among white participants ($p > .05$). Men in both conditions reported MAX-PC scores that remained within 1 *SD* of scores reported in other samples of APC [20].

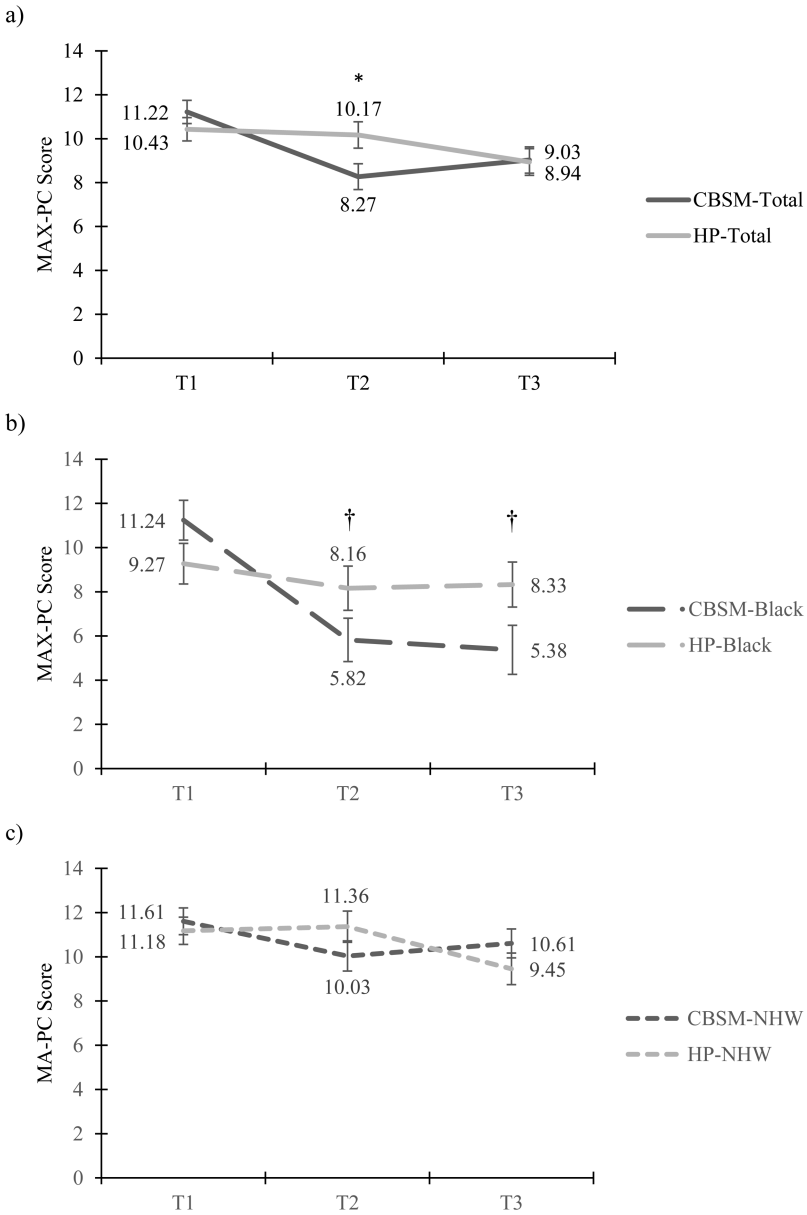

Fig 2 | (a) Memorial Anxiety Scale for Prostate Cancer (MAX-PC) scores over time for the Cognitive Behavioral Stress Management (CBSM) and Health Promotion (HP) conditions in the full sample, (b) MAX-PC scores over time for black men in the CBSM and HP conditions, and (c) MAX-PC scores over time for NHW men in the CBSM and HP conditions. †Marginally significant difference between lines; *statistically significant difference between lines.

DISCUSSION

In our sample of older men with APC, more than one third of the participants were black men (37.5%). This proportion of black men is higher than most other psychosocial research in PC, which ranges from 8% to 20% of reported samples [24–27]. In some cases, black men are unrepresented entirely. The proportion of black participants in this study is also higher than in our own prior studies of men with PC, which have ranged from 18% to 22% [28,29]. To our knowledge, there has been only one study that focused exclusively on black men with PC [16]. Notably, most prior psychosocial PC studies have focused on men with early-stage disease.

Tablet-delivered CBSM and attention-matched HP were both acceptable to this sample, and participants were engaged with both conditions. As hypothesized, there were no differences in patient engagement by race (NHW vs. black) despite the observation that black men in our sample were of lower SES than NHW men and constitute a hard-to-reach population [8,9]. Our study design likely promoted greater attendance and overall retention of older black men with advanced disease (e.g., flexible scheduling and transportation provided). These elements provide concrete suggestions for tailoring future interventions to similarly hard-to-reach populations.

Contrary to our hypothesis and preliminary findings [12], acceptability of both conditions was higher among black men. Black men rated all aspects of CBSM higher than NHW men and rated all aspects of HP as high as or higher than NHW men. These findings are novel and provide insight into the unmet supportive and educational needs of older black men with APC. We know from previous work that black oncology patients generally report greater unmet needs than NHW patients across multiple domains (e.g., informational, practical, emotional, spiritual) [30]. Thus, one possible explanation for our findings is that black men reported greater acceptability of the conditions because they served to meet some of the specific needs of this population (e.g., health-related information, emotional support, coping strategies). Indeed, it appears that once the obstacle of recruiting and retaining hard-to-reach older black men was successfully overcome [9], black men liked having accessible and interactive health information related to the CBSM intervention and HP components. Exploration of this and other possible explanations for greater acceptability among black men warrants attention in future studies.

Exploratory analyses of efficacy for reducing disease-specific distress in the total sample revealed an overall intervention effect on decreased PC-anxiety at 6 months, but this benefit was not sustained at 12 months. When racial groups were assessed separately, it became clear that black men in particular benefitted from the CBSM intervention. Black men in CBSM reported a significant reduction in PC-anxiety at 6 months, which was maintained at 12 months. By comparison, all other groups did not report significant changes in MAX-PC scores over time (i.e., black men in HP, NHW men in CBSM, NHW men in HP). Thus, within the CBSM condition, black men not only liked the intervention more but also reported greater benefits related to decreases in disease-specific distress. These findings may help us understand why black men rated the CBSM more favorably than did NHW men. It is possible that the specific content of the CBSM intervention (e.g., cognitive-behavioral and stress management skills) was novel to black participants and thus more effective for reducing disease-specific distress than it was for NHW participants. However, without a measure of prior knowledge of these skills, this conclusion remains speculative. Interestingly, NHW and black men did not differ on baseline PC-anxiety when they enrolled in the study approximately 5 years post-diagnosis. Extant research is mixed as to whether there are HRQoL disparities between NHW and black PC patients [6,8]. In our sample, before intervention, we did not find evidence of disparities related to PC-anxiety in this sample.

All participants were provided tablets, which limits generalization to individuals without access to mobile technology. We did not collect information about race prior to study enrollment because race was not part of our eligibility criteria; consequently, differences in recruitment by race could not be assessed. However, an important strength of this study was its sizeable proportion of black participants, which is generally higher than previously reported in psychosocial PC research. We also used a measure validated specifically with black and APC patients to assess preliminary efficacy, increasing the validity of our findings.

This report of patient engagement, acceptability, and efficacy of tablet-delivered CBSM and HP showed that participants with APC were engaged with both conditions. Both conditions were rated more favorably by black men, who also reported a unique intervention benefit related to reduced PC-anxiety. This study provides insight into the unmet needs of older black men with APC.

Acknowledgments: This study was funded by the National Institutes of Health's National Cancer Institute (grant number R01CA157809 to F.J.P., principal investigator). L.C.B. was funded by the National Institutes of Health's National Cancer Institute training grant number T32CA193193.

Compliance with Ethical Standards

Conflicts of Interest: All authors declare that they have no conflicts of interest.

Ethical Approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the Northwestern University Institutional Review Board and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent: Informed consent was obtained from all individual participants included in the study.

Welfare of Animals: This article does not contain any studies with animals performed by any of the authors.

References

1. American Cancer Society. Cancer facts & figures: 2018. Available at http://www.cancer.org. Accessibility verified February 1, 2018.
2. Roth AJ, Kornblith AB, Batel-Copel L, Peabody E, Scher HI, Holland JC. Rapid screening for psychologic distress in men with prostate carcinoma: a pilot study. *Cancer*. 1998;82(10):1904–1908.
3. Mehnert A, Lehmann C, Graefen M, Huland H, Koch U. Depression, anxiety, post-traumatic stress disorder and health-related quality of life and its association with social support in ambulatory prostate cancer patients. *Eur J Cancer Care (Engl)*. 2010;19(6):736–745.
4. American Cancer Society. Cancer facts & figures for African Americans: 2016–2018. Available at http://www.cancer.org. Accessibility verified February 1, 2018.
5. Anai S, Pendleton J, Wludyka P, et al. Prostate cancer screening and detection in inner-city and underserved men. *J Natl Med Assoc*. 2006;98(4):515–519.
6. Lubeck DP, Kim H, Grossfeld G, et al. Health related quality of life differences between black and white men with prostate cancer: data from the cancer of the prostate strategic urologic research endeavor. *J Urol*. 2001;166(6):2281–2285.
7. Kinlock BL, Parker LJ, Bowie JV, Howard DL, LaVeist TA, Thorpe RJ Jr. High levels of medical mistrust are associated with low quality of life

among black and white men with prostate cancer. *Cancer Control.* 2017;24(1):72–77.
8. Nelson CJ, Balk EM, Roth AJ. Distress, anxiety, depression, and emotional well-being in African-American men with prostate cancer. *Psychooncology.* 2010;19(10):1052–1060.
9. Ford JG, Howerton MW, Lai GY, et al. Barriers to recruiting underrepresented populations to cancer clinical trials: a systematic review. *Cancer.* 2008;112(2):228–242.
10. Rivers D, August EM, Sehovic I, Lee Green B, Quinn GP. A systematic review of the factors influencing African Americans' participation in cancer clinical trials. *Contemp Clin Trials.* 2013;35(2):13–32.
11. Penedo FJ, Antoni MH, Schneiderman N. *Cognitive-Behavioral Stress Management for Prostate Cancer Recovery Facilitator Guide.* Oxford, UK: Oxford University Press; 2008.
12. Yanez B, McGinty HL, Mohr DC, et al. Feasibility, acceptability, and preliminary efficacy of a technology-assisted psychosocial intervention for racially diverse men with advanced prostate cancer. *Cancer.* 2015;121(24):4407–4415.
13. National Cancer Institute. Prostate cancer. Available at http://www.cancer.gov/. Accessibility verified January 30, 2018.
14. National Heart, Lung, and Blood Institute. Aim for a healthy weight. Available at http://www.nhlbi.nih.gov. Accessibility verified January 30, 2018.
15. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis.* 1987;40(5):373–383.
16. Campbell LC, Keefe FJ, Scipio C, et al. Facilitating research participation and improving quality of life for African American prostate cancer survivors and their intimate partners. A pilot study of telephone-based coping skills training. *Cancer.* 2007;109(2 suppl):414–424.
17. Kissane DW, Grabsch B, Clarke DM, et al. Supportive-expressive group therapy for women with metastatic breast cancer: survival and psychosocial outcome from a randomized controlled trial. *Psychooncology.* 2007;16(4):277–286.
18. Roth AJ, Rosenfeld B, Kornblith AB, et al. The memorial anxiety scale for prostate cancer: validation of a new scale to measure anxiety in men with prostate cancer. *Cancer.* 2003;97(11):2910–2918.
19. Nelson CJ, Starr TD, Macchia RJ, Hyacinthe L, Friedman S, Roth AJ. Assessing anxiety in Black men with prostate cancer: further data on the reliability and validity of the Memorial Anxiety Scale for Prostate Cancer (MAX-PC). *Support Care Cancer.* 2016;24(7):2905–2911.
20. Johanes C, Monoarfa RA, Ismail RI, Umbas R. Anxiety level of early- and late-stage prostate cancer patients. *Prostate Int.* 2013;1(4):177–182.
21. Wilcox RR. Some results on a Winsorized correlation coefficient. *Br J Math Stat Psychol.* 1993;46(2):339–349.
22. Chipperfield K, Fletcher J, Millar J, et al. Predictors of depression, anxiety and quality of life in patients with prostate cancer receiving androgen deprivation therapy. *Psychooncology.* 2013;22(10):2169–2176.
23. Sidak Z. Rectangular confidence regions for the means of multivariate normal distributions. *J Am Stat Assoc.* 1967;62(318):626–633.
24. Parker PA, Pettaway CA, Babaian RJ, et al. The effects of a presurgical stress management intervention for men with prostate cancer undergoing radical prostatectomy. *J Clin Oncol.* 2009;27(19):3169–3176.
25. Lepore SJ, Helgeson VS, Eton DT, Schulz R. Improving quality of life in men with prostate cancer: a randomized controlled trial of group education interventions. *Health Psychol.* 2003;22(5):443–452.
26. Northouse LL, Mood DW, Schafenacker A, et al. Randomized clinical trial of a family intervention for prostate cancer patients and their spouses. *Cancer.* 2007;110(12):2809–2818.
27. Carmack Taylor CL, Demoor C, Smith MA, et al. Active for Life After Cancer: a randomized trial examining a lifestyle physical activity program for prostate cancer patients. *Psychooncology.* 2006;15(10):847–862.
28. Penedo FJ, Molton I, Dahn JR, et al. A randomized clinical trial of group-based cognitive-behavioral stress management in localized prostate cancer: development of stress management skills improves quality of life and benefit finding. *Ann Behav Med.* 2006;31(3):261–270.
29. Penedo FJ, Traeger L, Dahn J, et al. Cognitive behavioral stress management intervention improves quality of life in Spanish monolingual Hispanic men treated for localized prostate cancer: results of a randomized controlled trial. *Int J Behav Med.* 2007;14(3):164–172.
30. Weiss T, Weinberger MI, Holland J, Nelson C, Moadel A. Falling through the cracks: a review of psychological distress and psychosocial service needs in older Black and Hispanic patients with cancer. *J Geriatr Oncol.* 2012;3(2):163–173.