



For Whom Does Cognitively Based Compassion Training (CBCT) Work? An Analysis of Predictors and Moderators among African American Suicide Attempters

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Abstract

Objectives Both cognitively based compassion training (CBCT) and support-based group intervention have been found to be effective for African American suicide attempters in reducing suicidal ideation and depression, as well as enhancing self-compassion. This study aims to further our understanding of effective interventions by exploring participants' responses to both interventions.

Methods Exploratory analyses were conducted in a sample of low-income African Americans who had attempted suicide ($n = 82$) to determine how baseline demographic and psychological characteristics would (1) predict outcomes (i.e., suicidal ideation, depression, and self-compassion) regardless of intervention conditions and (2) moderate outcomes in interaction with intervention condition.

Results Non-reactivity, a mindfulness facet, was identified as an intervention moderator for suicidal ideation and depressive symptoms, suggesting that CBCT outperformed the support group for African American suicide attempters who had low baseline non-reactivity (or high reactivity). Individuals who had high non-reactivity at baseline appeared to benefit more from both conditions in self-compassion as an outcome. There was a pattern that homeless individuals benefited less in terms of their levels of depressive symptoms and self-compassion as outcomes regardless of the assigned condition. When applying Bonferroni corrections, only non-reactivity as an intervention moderator for depressive symptoms was significant.

Conclusions Findings reveal the relevance of mindfulness and to a lesser extent socioeconomic status in informing compassion-based intervention outcomes with this underserved population and the importance of intervention matching and tailoring to maximize treatment effects. Future large trials are needed to replicate findings and directions indicated from the current pilot study.

Keywords Compassion · Mindfulness · Intervention moderators · African Americans · Suicide

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Suicide was one of the ten leading death causes in the USA in 2017, making it an important public health issue (Murphy et al. 2018; Olfson et al. 2017). Recent years have witnessed the rise in rates of death by suicide among African Americans, especially in urban regions (Ivey-Stephenson et al. 2017). Thus, there is an urgent need for interventions to improve the well-being of African Americans who attempt suicide. Scholars assert that mindfulness and compassion-based interventions may be beneficial for African Americans through reducing levels of stress and thereby ameliorating depressive and trauma symptoms (Dutton et al. 2013; Woods-Giscombe and Black 2010). Derived from Buddhist contemplative practices (Kabat-Zinn 2011), such approaches have gained popularity and have been found to be effective for treating a wide array of disorders (Goldberg et al. 2018; Khoury et al. 2013; Kirby et al. 2017). Since belonging is a protective factor for

suicidal behaviors among African Americans and compassion-based practice pays specific attention to relational aspects of well-being, compassion-based interventions may be particularly relevant for African American suicide attempters (Kaslow et al. 2010, 1998).

Compassion in Buddhist traditions refers to attention and intention toward alleviating suffering (His Holiness the Dalai Lama 2001). Mindfulness refers to awareness that is cultivated through paying attention “on purpose, in the present moment, and non-judgmentally” (Kabat-Zinn 1994). Compassion is closely related to mindfulness, yet it has distinctive features and emphases such as the cultivation of positive affect and a kind orientation towards suffering (Davidson 2010; Jazaieri et al. 2014). The practice of self-compassion, which refers to being attuned to one’s own suffering, staying connected to it, and desiring to ameliorate this suffering (Neff 2003a), reduces levels of depression (Neff and Germer 2013). Compassion can be trained using specific techniques. Compassion-focused interventions improve problems associated with suicidal behavior, such as mood disorders and self-criticism (Leaviss and Uttley 2015). In a related vein, meta-analyses reveal that compassion- and kindness-based meditation reduce depressive symptoms and increase positive emotions and well-being (Galante et al. 2014; Kirby et al. 2017).

One of the established forms of compassion practice is cognitively based compassion training (CBCT), a secular practice that draws from the eleventh-century Tibetan Buddhist *lojong* tradition (Pace et al. 2013). CBCT is aimed at developing a compassionate and altruistic mind. It differs from many contemplative practices by its use of an analytical process to develop insight and active reorientation of thoughts, emotions, and values that cultivate compassion to challenge the roots of suffering—not seeing reality as it is, self-centeredness, and the belief that we are separate, independent beings (Ozawa-de Silva et al. 2012; Pace et al. 2013). CBCT incorporates a component of mindfulness in the first session through teachings on attention and mind stability, with the purpose of facilitating the development of compassion in the subsequent following five sessions, which focus on self-compassion, gratitude, appreciation, empathy, and compassion consecutively. A detailed description of CBCT can be found in published papers that describe randomized controlled trials (RCT) in which CBCT is one of the conditions (Pace et al. 2009) and at <http://tibet.emory.edu>.

Results from an RCT comparing a culturally adapted CBCT to a support-based group for African American suicide attempters revealed efficacy of both conditions, supporting the value of both interventions (LoParo et al. 2018). However, little is known regarding *which intervention is more effective for whom*, which can provide valuable insight into future intervention development, matching, and further tailoring of interventions. This inquiry about intervention response by individuals is a question that has been asked by psychologists

and psychotherapy researchers for decades (Paul 1967). Consistent with this, the National Institute of Health has called for “personalized medicine,” which represents the idea that a patient’s individual characteristics matter and interventions should be matched and tailored based on the individual (Hamburg and Collins 2010). Originally focused on using genetics to inform medical treatment, this notion has been applied to mental health interventions (Insel 2009). Doing so requires analyzing both predictors and moderators of intervention outcomes. In the context of RCTs, predictors (or *non-specific predictors*) refer to individual characteristics at baseline that predict intervention outcomes regardless of the nature of the intervention (Kraemer et al. 2002). Predictors provide information on what types of patients respond to interventions for a given problem more or less favorably in general. Moderators, on the other hand, are individual characteristics at baseline that interact with intervention condition to predict outcomes and thus provide useful information about differential response to intervention by subgroups (Kraemer et al. 2002; MacKinnon 2011). Investigation of both predictors and moderators was promoted by the American Psychological Association’s (APA) Presidential Task Force on Evidence-Based Practice, which noted that research must ascertain the impact of patient characteristics on intervention selection, processes, and outcomes (American Psychological Association 2006). For suicide attempters, information about predictors and moderators can inform our understanding of intervention generalization in terms of which treatment works better for whom and guide decisions about intervention delivery and refinement (MacKinnon 2011).

Intervention outcome research with individuals exhibiting suicidal behavior (Forkmann et al. 2014; Neacsiu et al. 2010; Slee et al. 2008), including African American suicide attempters (Zhang et al. 2013), has primarily focused on intervention mediators. An RCT with adolescents attempting suicide found females to be more responsive to the intervention (Huey et al. 2004). No studies have examined predictors and moderators of intervention outcome for African Americans who have attempted suicide, which is concerning given, as noted previously, the recent rise in rates of death by suicide in this population (Curtin et al. 2016; Ivey-Stephenson et al. 2017). Further, only limited research has attended to predictors and moderators of compassion-based interventions. A study found that smokers who benefited most from a self-compassion intervention were low in readiness to change, were high in self-criticism, and had vivid imagery during guided imagery exercises (Kelly et al. 2010). Two studies suggest the relevance of mindfulness as a moderator: a compassion training pilot found that individuals with higher non-attachment at baseline benefited the most from the compassion condition in terms of social stress responses (Arch et al. 2016), and a recent trial of Compassion Cultivation Training (CCT) in a community sample found that baseline

mindfulness skills moderated individuals' response to CCT compared with a waitlist, such that those with higher mindfulness responded more favorably to CCT (Goldin and Jazaieri 2017). Two studies on a Mindful Self-Compassion (MSC) program and mobile app-based self-compassion training did not find significant moderators of intervention outcomes (Finlay-Jones et al. 2018; Mak et al. 2018).

The current study explores the effects of baseline demographic and psychological characteristics as predictors and moderators of intervention outcomes in a randomized controlled trial comparing CBCT and a support-based group for African American suicide attempters. To gain a comprehensive picture, three intervention outcomes essential to this population and the intervention are selected, namely suicidal ideation, depressive symptoms, and self-compassion. Two demographic characteristics, namely gender and homelessness, were selected as potential predictors/moderators. Participants' baseline mindfulness traits were examined as psychological-based predictors/moderators. Two preliminary hypotheses were formed. First, gender and homelessness status (demographics) would predict but not moderate intervention response such that participants who were female, younger, and not homeless would benefit more (i.e., lower levels of depression and suicidal ideation and higher levels of self-compassion) regardless of condition randomization. Second, baseline mindfulness would serve as moderator (interact with intervention condition to predict outcomes) of intervention response, such that individuals with higher baseline mindfulness would respond more favorably (i.e., endorse lower depression and suicidal ideation and higher self-compassion) than those with lower mindfulness if randomized to CBCT as compared with the support-based group.

Methods

Participants

Participants were eligible for the study if they (a) self-identified as African American or Black, (b) attempted suicide in the previous year, (c) were 18–64 years of age, and (d) spoke English. Potential participants were excluded if their cognitive or psychiatric functioning precluded their participation (i.e., impaired mental status, acute psychosis) (S. B. Johnson et al. 2018). Among participants who completed the baseline assessment, randomized to condition, and completed intervention and post-intervention assessment, a total of 82 provided valid data for analysis in this study. We present detailed demographic information in Table 1.

Table 1 Baseline characteristics in CBCT ($n = 51$) and support group ($n = 31$) among completers

	CBCT	Support group
Categorical variables	<i>N</i> (%)	<i>N</i> (%)
Gender (female)	26 (51.0)	17 (54.8)
Homeless	32 (62.7)	18 (58.1)
Education		
Less than 12th grade	21 (41.2)	13 (41.9)
High school/GED	10 (19.6)	10 (32.3)
Some college/tech school	15 (29.4)	5 (16.1)
College or tech school graduate	4 (7.8)	2 (6.5)
Graduate School	1 (2.0)	0 (0)
Currently employed	2 (3.9)	4 (12.9)
Monthly income		
0–249	35 (70.0)	23 (74.2)
500–499	3 (6.0)	2 (6.5)
499–999	10 (20.0)	6 (19.4)
1000–1999	2 (4.0)	0 (0)
2000+	0 (0)	0 (0)
Continuous variables	<i>M</i> (SD)	<i>M</i> (SD)
Age (years)	41.5 (10.6)	43.9 (10.8)
Number of past attempts	5.0 (6.3)	4.9 (4.25)
Baseline suicide ideation	21.5 (6.7)	20.6 (7.8)
Baseline depressive symptoms	34.2 (12.1)	33.32 (13.21)
Baseline self-compassion	53.5 (13.0)	57.0 (17.2)

Note: Suicide ideation was measured by the Beck Scale for Suicide Ideation (BSS), depressive symptoms were measured by the Beck Depression Inventory-II (BDI-II), and self-compassion was measured Self-Compassion Scale (SCS)

Procedures

All participants were recruited from the largest inner-city public hospital in the state of Georgia, an inner-city public hospital, following the approval of the research protocol by both the affiliated university's Institutional Review Board and the hospital's Research Oversight Committee. Following intensive recruitment training, team members approached potential participants in hospital waiting rooms and inpatient units. Individuals willing to speak with team members were screened to determine if they met basic inclusion criterion and, if so, were scheduled for a baseline assessment of approximately two hours in duration. After completion of the baseline assessment, they were randomized to the six-session CBCT group intervention or a six-session support-based group intervention. Six weeks later, participants completed the post-intervention assessment.

The CBCT group was co-facilitated by two individuals trained through the Emory-Tibet Partnership and was adapted to ensure its cultural relevance. Cultural adaptation included altering descriptive language for meditation practice to

enhance understandability, providing relevant metaphors, and drawing connections between meditation and participants' religious tradition (e.g., Christian contemplative tradition) (LoParo et al. 2018). Groups included didactics, discussion, and meditation practice. Participants were encouraged to practice at home using audio recordings of guided meditations. The six sessions focused on attention and mindfulness, self-compassion, equanimity and gratitude for others, appreciation of and affection for others, empathy and compassion for others, and deepening compassion through actions to become more altruistic (Pace et al. 2009, 2013). Participants in the support-based group participated in a 6-week unstructured group in which they were encouraged to share and discuss their concerns and support each other. Support group sessions did not include mindfulness or compassion-based practices.

Measures

Three measures were used at baseline and post-intervention assessments to capture the three outcome variables: suicidal ideation, depressive symptoms, and self-compassion.

Suicidal Ideation The Beck Scale for Suicide Ideation (BSS; 21-item) was used to measure the presence and severity of suicidal thinking (Beck et al. 1996), at baseline and post-intervention assessments. Participants answered questions on a 3-point Likert scale and total scores ranged from 0 to 42, with higher scores representing higher severity of suicidal ideation. BSS has shown to be a robust measure in population-based research (Batterham et al. 2015). It has been previously used with African Americans and showed good reliability and validity (Houry et al. 2006; Lamis and Lester 2012). In this study, Cronbach's α values at pre- and post-intervention for the BSS were 0.83 and 0.86, respectively, indicating good internal consistency.

Depressive Symptoms The Beck Depression Inventory-II (BDI-II) assessed the severity of depressive symptoms over the prior 2 weeks (Beck et al. 1996), at the baseline and the post-intervention assessments, and served as a secondary outcome variable of interest. Participants rated 21 cognitive, affective, and somatic symptoms on a scale of 0 to 3. A total score ranging from 0 to 63 was calculated, with higher scores indicating greater symptom severity. Studies of the BDI-II with low-income African American suicide attempters have shown the measure to have good internal reliability and validity (Joe et al. 2008). Cronbach's α values in the current sample at pre- and post-intervention were 0.90 and 0.94, indicating excellent internal consistency.

Self-compassion The Self-Compassion Scale (SCS; 26-item) was used to examine self-compassion (Neff 2003b), which includes six subscales (self-kindness, self-judgment, common

humanity, isolation, mindfulness, and over-identification). The SCS has consistently been shown to have good reliability and validity in multiple samples and settings, including support of its factor structure across 20 diverse samples (Neff 2003b, 2016; Neff et al. 2019). In a clinical sample of African Americans, confirmatory factor analyses supported a six-factor correlated model of the SCS and the measure demonstrated good internal consistency reliability and strong convergent validity with measures of suicidal ideation, depressive symptoms, self-criticism, and mindfulness (Zhang et al. 2019). Cronbach's α values in this sample were 0.87 and 0.98 at pre- and post-intervention, respectively, which suggests satisfactory internal consistency reliability. As suggested by Neff and her colleagues for clinical intervention research (Neff 2016; Neff et al. 2017, 2019), we used the total score of the SCS to represent levels of self-compassion.

Demographic Characteristics Gender and housing status (homeless or not) as demographic characteristics based predictor/moderator variables were captured using the Demographic Data Form (Johnson et al. 2018).

Mindfulness The Five-Facet Mindfulness Questionnaire (FFMQ) (Baer et al. 2008) was used to assess mindfulness as a reflection of psychological characteristics at baseline. The FFMQ, which uses ratings on a 5-point Likert scale, was empirically developed via a process of analyzing the specific items of five previously existing measures of mindfulness and thus, it is deemed to be a comprehensive operationalization of the construct. The five facets include the following: observing (e.g., "When I'm walking, I deliberately notice the sensations of my body moving"), describing (e.g., "I can usually describe how I feel at the moment in considerable detail"), act with awareness (e.g., "When I do things, my mind wanders off and I'm easily distracted"), non-judging (e.g., "I tell myself I shouldn't be feeling the way I'm feeling"), and non-reactivity (e.g., "When I have distressing thoughts or images, I just notice them and let them go"). Psychometric evaluations of the FFMQ have supported the measure's factor structure, reliability, and validity in non-meditators, experienced meditators, and non-clinical samples (Baer et al. 2008; Bohlmeijer et al. 2010; Christopher et al. 2012). In a clinical sample of African Americans, the FFMQ has been shown to have a five-factor structure, satisfactory internal consistency reliability, and strong construct validity (Watson-Singleton et al. 2018). In the current sample, internal consistency reliability was satisfactory (Cronbach's α was 0.88 at baseline and 0.85 at post-intervention). Cronbach's α values for observing, describing, acting with awareness, non-judging, and non-reactivity at baseline were 0.75, 0.84, 0.84, 0.80, and 0.72, and the α s of the five facets at post-intervention were 0.78, 0.80, 0.86, 0.76, and 0.78 respectively.

Data Analysis

We incorporated a domain-based approach to investigate the roles of baseline characteristics in informing response to interventions (Amir et al. 2011; Fournier and DeRubeis 2009). Multiple linear regression (MLR) was used for the analyses. For each proposed predictor and moderator, two regression models were conducted; the first examined the effect of the variable alone as a predictor for each outcome variable with the entire sample regardless of intervention condition, and the second investigated the interaction (i.e., moderating effect) between the intervention condition and the proposed outcome variable on post-intervention (Oakes and Feldman 2001; Van Breukelen 2006). If a variable is significant both as a predictor and a moderator, it is most appropriate to conceptualize it as a moderator (Kraemer et al. 2002). Baseline scores on the outcome measures served as covariates in all regression models. All continuous moderators were mean-centered. The magnitude and significance of the both the predictor and the moderator variable coefficients were evaluated (Aiken and West 1991). As mindfulness consists of multifaceted meanings and it has been suggested that the FFMQ can be used to measure independent constructs (Gu et al. 2016; Watson-Singleton et al. 2018; Williams et al. 2014), we tested each facet of mindfulness (i.e., observing, describing, acting with awareness, non-judging, non-reactivity) as unique potential predictors and moderators in regression analyses. This approach also provides us more capacity to understand potential mechanisms of how baseline mindfulness may engender intervention outcome. For instance, the relational component of mindfulness (e.g., how we respond to our inner experiences), such as non-judging and non-reactivity, may have greater interaction with the intervention condition to inform outcome, compared with the attentional component of mindfulness to our experiences (e.g., observing and describing).

Following hypothesis testing, a final model with significant predictors and moderators from each domain was formulated to determine its effect on the post-treatment levels of each of the outcomes (suicidal ideation, depression, and self-compassion) separately. Prior to formulating the final model, a bivariate correlation analysis was performed to ascertain potential multicollinearity among variables that could impact the final regression model. This correlation analysis revealed that two psychological characteristic moderators for depressive symptoms strongly correlated with each other: observing and non-reactivity: $r = 0.54$, 95% CI = [0.36, 0.67], $p < .0001$. To avoid multicollinearity, we only included non-reactivity, a facet of FFMQ and the most significant moderator, in the final model for depressive symptoms. As a result, multicollinearity was not detected in the final model.

Post Hoc Analysis Bonferroni adjustments often are used to modify overall significance levels in post hoc analysis.

However, as pointed out by some statisticians (Nakagawa 2004; Perneger 1998), such adjustments increase the probability of type II error and the risk of clinically relevant differences going unrecognized. In the context of predictor and moderator analyses for this RCT with African American suicide attempters, which is an underrepresented and difficult to recruit population, we report findings *both prior to and after the Bonferroni adjustment* for two main reasons. First, as intervention predictor/moderator analyses are explorative and aim at generating hypotheses for large trials (Kraemer et al. 2006), significant findings prior to adjustment can still provide meaningful “signals” for directions and patterns to look for in future research. Thus, potentially inflated type I error is viewed as less pernicious than limiting the exploration of intervention predictors/moderators in this context. Second, intervention moderator analyses provide clinical guidance on matching and tailoring. Given the mental health and treatment disparities that low-income African Americans experience as well as the need to optimize treatment effect particularly when working with underserved populations (González et al. 2010; Interian et al. 2013), findings prior to the Bonferroni adjustment may reveal meaningful clinical patterns, generate knowledge, and provide practical guidance for the maximization of treatment effects in the “real-world” implementation context. The Bonferroni adjustment was applied to uncover any predictors/moderators that may achieve a more rigorous scientific standard, using a corrected α level of p value equals to .0034 (0.05/16). For the interaction terms that remained significant, we used simple slope analysis and the Johnson-Neyman (J-N) technique for post hoc probing (Aiken and West 1991; Johnson and Fay 1950).

Results

Predictor and Moderator Analyses for Suicidal Ideation

Homelessness was found to be a significant moderator of participants’ suicidal ideation outcome ($B = 10.34$, 95% CI = [1.30, 19.39], $p = .03$). Specifically, homeless individuals enrolled in the CBCT had significantly lower levels of suicidal ideation compared with their counterparts in support group. No other demographic predictors or moderators were found for suicidal ideation.

Baseline non-judging attitude, a mindfulness facet, was a significant predictor; individuals with higher levels of non-judging attitude had lower suicidal ideation in both conditions ($B = -2.97$, 95% CI = [- 5.63, - 0.32], $p = .03$), confirming our hypothesis. Non-reactivity emerged as a significant moderator: those with lower non-reactivity at baseline had better outcome (lower suicidal ideation) in CBCT while individuals with higher non-reactivity at baseline performed better in

support group ($B = 8.62$, 95% CI = [2.46, 14.78], $p = .008$). Of note, the main effect of non-reactivity in this interaction regression model was statistically significant ($B = -7.10$, 95% CI = [-12.73, -1.48], $p = .01$), yet since non-reactivity was not a significant single predictor and this main effect is not strong compared with the interaction effect, we do not interpret this effect (Aiken and West 1991). No other psychological characteristics emerged as predictors or moderators of suicidal ideation.

The final model for suicidal ideation included non-judging as a predictor and homelessness and non-reactivity as moderators, with baseline levels of suicidal ideation serving as a covariate. Non-judging remained as a significant predictor ($B = -2.80$, 95% CI = [-5.67, -0.55], $p = .03$). Non-reactivity was a significant moderator ($B = 8.17$, 95% CI = [3.34, 15.99], $p = .02$). The main effect of non-reactivity was not interpreted due to the stronger significance of the interaction. Homelessness was no longer a significant predictor in this final model.

Predictor and Moderator Analyses for Depressive Symptoms

Homelessness was the only significant demographic predictor of participants' levels of depressive symptoms ($B = 6.05$, 95% CI = [0.13, 12.0], $p = .045$). As predicted, participants who were homeless at baseline had significantly higher levels of depressive symptoms at post-intervention than those individuals who were not homeless. No demographic variables served as moderators.

Two baseline psychological characteristics that are facets of mindfulness were found to be significant predictors and moderators of intervention outcome. Regardless of condition, observing ($B = 3.53$, 95% CI = [0.68, 6.39], $p = .02$) and non-reactivity ($B = 3.08$, 95% CI = [0.21, 5.94], $p = .04$) were significant predictors of depressive symptoms. However, contrary to what was predicted, participants with lower levels of both mindfulness benefited more from both interventions in terms of levels of depressive symptoms than did those with higher levels.

The same two baseline psychological characteristics, namely observing and non-reactivity, significantly interacted with intervention condition (i.e., moderated) to predict post-intervention levels of depressive symptoms ($B = 5.92$, 95% CI = [0.23, 11.62], $p = .04$ for observing \times condition, and $B = 7.72$, 95% CI = [2.15, 13.29], $p = .007$ for non-reactivity \times condition). The main effect of observing ($p = .96$) and non-reactivity ($p = .46$) was not significant when the interaction term was included in the regression model. However, opposite to what was expected, people with higher observing and non-reactivity benefited more from the support group, while those with lower levels of observing and non-reactivity benefited more from CBCT. As both observing and non-reactivity were

significant predictors and moderators, it is most appropriate to conceptualize them solely as moderators (Kraemer et al. 2002).

The final regression model for depressive symptoms as the outcome included homelessness as a predictor, non-reactivity as an intervention moderator (non-reactivity \times condition) (as noted above observing was not included to eliminate multicollinearity), and baseline levels of depressive symptoms as a covariate. The interaction between non-reactivity and intervention condition remained significant (also the only significant finding after corrections) ($B = 8.34$, 95% CI = [2.96, 13.71], $p = .003$). Homelessness also had a predicting effect ($B = 7.15$, 95% CI = [1.69, 12.61], $p = .01$). Figure 1 illustrates this interaction effect. The model was significant ($p < .00001$, adjusted $R^2 = .42$, $F = 11.87$ (5, 70)). Post hoc model analysis (i.e., model comparison) suggested that the final model was superior ($p = .0007$) to using baseline depressive symptoms as a single predictor, as it accounted for 16.9% additional variance in predicting post-intervention depressive symptoms.

Post hoc Probing Probing was completed for non-reactivity \times condition, the only term that met the Bonferroni p value correction ($p = .0033$ with 16 regression models). Probing revealed that the regression coefficients for CBCT and support group interventions were $B = 6.08$ ($t = 3.52$, $p = .0008$) and $B = -2.26$ ($t = -1.09$, $p = .28$), respectively. Analysis of significant regions based on the final model found that predicted post-intervention depressive symptoms levels between CBCT and support group significantly differed for individuals with baseline non-reactivity lower than -0.21 SD (non-reactivity < 18.8) and higher than $+1.72$ SD (non-reactivity > 28.6). Regardless of condition, homeless individuals had 7.15 more points on the BDI-II at post-intervention as compared with their counterparts who had stable housing.

Predictor and Moderator Analyses for Self-Compassion

Homelessness was the only demographic characteristic that had a predicting effect on participants' self-compassion outcomes ($B = -6.98$, 95% CI = [-13.47, -0.44], $p = .04$) (Table 2). As hypothesized, participants who were homeless had less desirable outcome (i.e., lower levels of self-compassion at post-intervention) compared with their non-homeless counterparts, regardless of the assigned intervention condition. No demographic variables were moderators for self-compassion outcomes.

One psychological characteristic emerged as a predictor. Specifically, non-reactivity emerged as a significant predictor of participants' self-compassion outcome, regardless of their assigned condition ($B = -3.85$, 95% CI = [-7.48, -0.21], $p = .04$). Participants who had higher

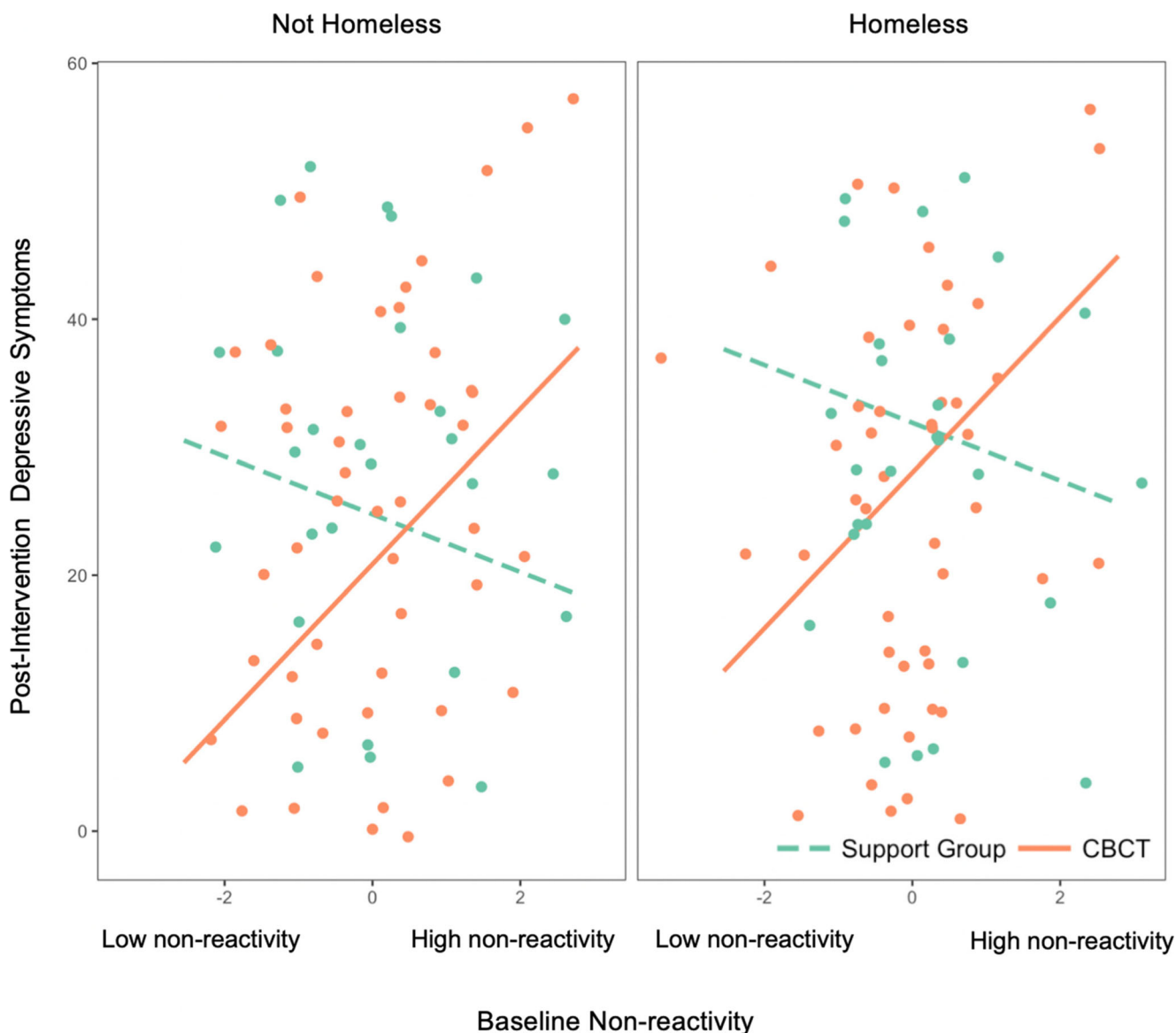


Fig. 1 Non-reactivity as a moderator (\times intervention condition) among non-homeless and homeless African American suicide attempters in CBCT and support-based group conditions. Note. CBCT cognitively

based compassion training. Baseline non-reactivity is centered (mean = 0, SD = 1). Baseline depression is controlled for in the plot

levels of non-reactivity at baseline performed better in self-compassion in both conditions. No psychological variables emerged as moderators of self-compassion as the outcome.

Thus, the final regression model for self-compassion as the outcome included homelessness and non-reactivity as predictors and baseline levels of self-compassion as a covariate. Both homelessness ($B = -6.72$, 95% CI = $[-13.22, -0.22]$, $p = .03$) and non-reactivity ($B = -3.62$, 95% CI = $[-7.19, -0.05]$, $p = .047$) were maintained as significant predictors in this model. Participants who were not homeless and endorsed higher non-reactivity at baseline benefited more from both conditions in terms of self-compassion at post-intervention.

Discussion

The current study examined intervention predictors and moderators among African American adult suicide attempters randomized to CBCT and a support-based group in order to identify both patient characteristics influencing intervention responsiveness in general and to ascertain for whom each condition works the best. Largely, both intervention conditions appear equally beneficial when considering the three outcomes (suicidal ideation, depressive symptoms, self-compassion) for most baseline characteristics. While recognizing that only non-reactivity was a significant moderator that meets Bonferroni criteria of multiple comparison correction, there are emerged patterns from findings that are relevant

Table 2 Predictors and moderators of suicidal ideation, depression, and self-compassion

Predictor/moderator	1. Suicidal ideation (BSS)				2. Depression (BDI)				3. Self-compassion (SCS)						
	B	SE	t	p	F	B	SE	t	p	F	B	SE	t	p	F
Demographic characteristics															
Gender	-0.30	2.10	-0.14	.89	0.02	-0.10	0.13	-0.76	.45	0.58	0.07	0.15	0.50	.62	0.25
Gender × condition	-0.36	4.47	-0.08	.94	0.94	-6.06	4.88	-1.24	.22	0.22	-5.47	5.38	-1.02	.31	1.03
Homeless	-0.86	2.27	-0.38	.71	0.14	6.05	2.97	2.04	.045*	4.14	-6.95	3.27	-2.12	.04*	4.51
Homeless × condition	10.34	4.44	2.33	.03*	5.42	9.74	5.94	1.64	.11	2.69	-12.54	6.60	-1.90	.06	3.61
Psychological characteristics															
Mindfulness	-0.47	1.26	-0.37	.71	0.14	2.83	1.71	1.66	.10	2.74	-1.94	2.16	-0.90	.37	0.81
Mindfulness × condition	2.45	2.65	0.93	.36	0.86	4.87	2.87	1.69	.09	2.88	-1.33	3.37	-0.40	.69	0.16
Observing	1.37	1.15	1.19	.24	1.41	3.53	1.43	2.47	.02*	6.08	-2.21	1.70	-1.30	.20	1.68
Observing × condition	1.74	2.46	0.71	.48	0.50	5.92	2.86	2.07	.04*	4.30	-1.93	3.33	-0.58	.56	0.34
Describing	0.68	1.20	0.57	.57	0.32	0.52	1.61	0.32	.75	0.10	-1.32	1.75	-0.76	.45	0.57
Describing × condition	-0.93	2.45	-0.38	.71	0.15	2.74	3.07	0.89	.38	0.80	0.44	3.42	0.13	.90	0.02
Act w/ awareness	-1.69	1.38	-1.23	.23	1.51	-0.79	1.81	-0.44	.67	0.19	1.96	1.75	1.12	.27	1.26
Act w/ awareness × condition	-0.74	2.88	-0.26	.80	0.07	-4.45	3.05	-1.46	.15	2.13	1.66	3.35	0.50	.62	0.25
Non-judging	-2.97	1.30	-2.28	.03*	5.20	-0.82	1.64	-0.50	.62	0.25	1.20	1.75	0.69	.49	0.47
Non-judging × condition	-0.83	2.82	-0.30	.77	0.09	-0.51	3.16	-0.16	.87	0.03	-1.60	3.43	-0.47	.64	0.22
Non-reactivity	0.01	1.28	0.01	.99	0.001	3.08	1.44	2.14	.04*	4.58	-3.85	1.82	-2.11	.04*	4.44
Non-reactivity × condition	8.62	3.02	2.86	.008**	8.15	7.72	2.79	2.77	.007**	7.65	-1.22	3.28	-0.37	.71	0.14
Final model															
Intercept	2.54	5.12	0.50	.62		2.97	4.32	0.69	.49		27.92	7.11	3.93	<.001***	
Baseline outcome variable (BDI/BSS/SCS)	0.64	0.15	4.39	.001**	19.68	0.64	0.11	5.95	<.001***	37.43	0.62	0.12	5.18	<.001***	22.83
Homeless	-1.63	3.65	-0.45	.66	0.11	7.15	2.74	2.61	.01*	6.30	-6.72	3.27	-2.06	.03*	4.77
Non-reactivity	-6.46	3.03	-2.13	.04*	0.77	-2.26	2.08	-1.09	.28	4.52	-3.62	1.79	-2.02	.047*	4.08
Condition	-2.12	4.32	-0.49	.63	0.09	-3.90	2.75	-1.42	.16	1.51					
Non-reactivity × condition	8.17	3.19	2.56	.02*	6.55	8.34	2.69	3.09	.003**	9.58					
Homeless × condition	7.15	4.82	1.48	.15	5.83										
Non-judging	-2.80	1.25	-2.25	.03*	6.32										

Note: CBCT and support group were entered as intervention condition (1 = support group, 2 = CBCT). Gender (0 = female, 1 = male) and homeless (0 = not homeless, 1 = homeless) were dummy coded. Continuous predictors/moderators were mean-centered. Non-reactivity as an intervention moderator for depressive symptoms was the only significant result after Bonferroni corrections. Regarding the three final models, for model 1 (suicidal ideation): adjusted $R^2 = 0.48$, $F = 5.62$, $p = .0004$, model 2 (depression): adjusted $R^2 = 0.42$, $F = 11.87$, $p < .0001$; and model 3 (self-compassion): adjusted $R^2 = 0.26$, $F = 10.56$, $p < .001$

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

for clinical practice and lay the groundwork for hypothesis testing in future trials. Across the three intervention outcome variables, exploratory analyses consistently suggested that one demographic factor, a socioeconomic indicator namely homelessness, and one psychological factor, non-reactivity, a mindfulness facet at baseline, may be clinically relevant in informing outcomes. This suggests that when matching and tailoring interventions for African American suicide attempters and considering their likelihood of improvement, their homelessness status and levels of non-reactivity at baseline should be considered. The gathering of such information is timely given recent calls for treatment process and outcome research with people of color and low-income individuals, as well as the demonstrated need for a more nuanced understanding of responsiveness to contemplative-based interventions (Waldron et al. 2018).

Overall, our results confirmed some of our preliminary hypotheses on the predictive roles of demographic characteristics in determining intervention outcomes, yet countered our expectation that individuals with higher mindfulness traits (psychological characteristic) at baseline would benefit more from CBCT. African American suicide attempters who were homeless (demographic characteristic) showed a poorer response to intervention, regardless of condition, in terms of their post-intervention levels of depressive symptoms and self-compassion. Yet they had a slightly superior response with regard to their levels of suicidal ideation in the CBCT condition compared with the support-based group. Further, African American suicide attempters who endorsed higher levels of non-reactivity at baseline performed better on their self-compassion levels in both conditions, yet intervention was most effective with regard to improvements in suicidal ideation and depressive symptoms when those with lower non-reactivity were randomized to CBCT and those with higher non-reactivity conditioned to the support-based group. In addition to homelessness and non-reactivity, individuals who had higher non-judging, another mindfulness facet (psychological characteristic), responded better with regard to their levels of suicidal ideation in both conditions.

Historically, psychological intervention research has paid less attention to social class-related variables (e.g., homelessness, employment) than to other forms of diversity (Kim and Cardemil 2012). Social class is vital to consider when working with individuals who are depressed and suicidal, as theoretical assertions and empirical research suggest a link between social class and depression/suicidality (Milner et al. 2012; Missinne and Bracke 2012). Homelessness, often an indicator of housing affordability and socioeconomic stress (Thomas 2012), is a chronic stressor that may contribute to the pervasiveness of psychological distress (Lippert and Lee 2015). A previous study with homeless veterans randomized to self-compassion and stress inoculation trainings found both interventions effective in reducing levels of post-traumatic stress

disorder (Held and Owens 2015). Our analysis revealed that CBCT may work better than a support-based group for homeless individuals in terms of lowering their levels of suicidal ideation, showing the potential utility of this intervention for a highly underserved and distressed population. However, CBCT was not more effective than a support-based group in the less high-risk outcomes linked to suicidal ideation (i.e., depressive symptoms, self-compassion). It might be that although the interventions (CBCT, support-based group) helped individuals in this study gain coping skills and receive support, they did not address environment-induced stress and subsequent psychological consequences for participants who were homeless. Stressors related to homelessness, such as violence exposure and health-related behavior problems, may be too weighty for weekly based group interventions to mitigate and may demand more intensive care. Indeed, there is meta-analytic evidence that assertive community treatment with homeless populations, which is an intensive and interdisciplinary-based intervention model, is effective in reducing psychiatric symptoms (Coldwell and Bender 2007). Additionally, homeless individuals who often have an extensive trauma history might have been affected by “backdraft,” a phenomenon that is common for trauma survivors in self-compassion practice during which they re-encounter old wounds and experience difficult emotions (Germer and Neff 2015).

We identified several psychological characteristics at baseline that served as intervention predictors (non-judging for suicidal ideation, non-reactivity for self-compassion) and moderators (non-reactivity for suicidal ideation and depressive symptoms), with non-reactivity as an impactful moderator or predictor across three outcomes. One question is *why non-reactivity to one’s inner experiences was a meaningful characteristic that inform intervention matching and outcome* in this context. Non-reactivity, a mindfulness quality, refers to the ability to allow inner experiences (e.g., thoughts and feelings) to come and go without judgment (Hölzel et al. 2011). It has been associated with an increased level of cognitive control flexibility (Anicha et al. 2012). Non-reactivity is a facilitator of adaptive emotion regulation (e.g., reappraisal, acceptance), which in turn can ameliorate depression (Chambers et al. 2009; Curtiss et al. 2017; Iani et al. 2019). In contrast, reactivity has been found to play a key role in the triggering, recurrence, and maintenance of depressive symptoms (Elgersma et al. 2015; Scher et al. 2005). A longitudinal study found that reactivity to induced rumination predicted higher levels of depressive symptoms at 12 months follow-up (Kuehner et al. 2009). Reactivity is also relevant to suicidal behavior. One study found that suicidal thoughts and homelessness as indicators of cognitive reactivity to low mood mediated the neuroticism—depression link in people with a history of depression (Barnhofer and Chittaka 2010). An efficacy analysis associated with this project (LoParo et al. 2018)

revealed that the overall level of non-reactivity increased slightly in CBCT condition yet decreased in the support group (differences not significant within or between groups), suggesting that there might be different pathways linked to intervention outcomes as both interventions were effective.

In the context of the CBCT intervention, two unique features may contribute to this result. First, the training starts with stabilization of the practitioners' mental activity, and such practice may be particularly beneficial for those with high reactivity at baseline in the reduction of maladaptive response to inner experiences that may maintain suicidal thoughts and depressive symptoms. Second, another unique feature of CBCT is its analytical, cognitive approach that emphasizes critical thinking and deliberate reflection on the interconnected nature of all beings. This approach aims to achieve insights over one's thoughts, emotions, and automatic responses, which could be particularly helpful for those who are more reactive at baseline. Although these two distinct features (mind stabilization and analytical approach) are not unique to compassion-based interventions, they may be relevant to the subpopulation of African American suicide attempters with high reactivity.

Findings of the current investigation provide a further nuanced understanding that CBCT intervention may not be the treatment of choice for suicide attempters who are already high on non-reactivity. However, for individuals who are low on this trait, through developing compassion for self and others, the CBCT intervention may ameliorate their levels of suicidal ideation and depressive symptoms. This might be that compassion practice helps those with high levels of reactivity to regulate their disturbing thoughts and emotions linked to their suicidality and depressive symptoms. On the other hand, those who had high levels of reactivity might not have benefitted as much from the support group, as its less structured and more interpersonal nature may have "turned on" the automatic arousal of stress that may feel overwhelming and difficult to manage.

Individuals with high levels of non-reactivity to start with appeared to be more likely or prone to cultivate self-compassion in both conditions. This may not be surprising as non-reactivity has been found to correlate with self-compassion (Kuyken et al. 2010). It might be that both intervention conditions facilitate the cultivation of self-compassion yet via different mechanisms. For example, it may be via intentional compassion practice in the CBCT condition and through an interpersonal pathway (e.g., receiving support from others promotes self-compassion) in the support-based group that self-compassion is cultivated. In contrast, individuals who are highly reactive may be quick to judge their inner experiences and thus result in less space for attending to and being kind to oneself.

Similar to the impact of non-reactivity on self-compassion, the predictive role of non-judging on suicidal ideation in both

conditions is curious. A recent study with psychiatric inpatients revealed that thwarted belongingness (i.e., loneliness and disconnection from others) mediated non-judging-suicidal ideation link (Roush et al. 2018). This finding might give some insight into potential mechanisms that explain how non-judging informs suicidal ideation. Individuals with high levels of non-judging may be more capable of using this skill to reduce their thoughts and feelings related to loneliness and disconnection through compassion-based meditation training or direct interpersonal interaction with others, which can result in lowered suicidal ideation. Among the five facets of mindfulness, both non-reactivity and non-judging emphasize how one skillfully relates to one's thoughts and feelings, and this may be clinically relevant for interventions for suicide attempters.

Limitations and Future Research Directions

Study findings should be interpreted in the context of its limitations. First, our sample size was small and attrition rates over time were high and thus, the statistical power to detect moderators was limited. For instance, we designed a follow-up assessment at 3 months after completion of the RCT yet were unable to include these data in the analyses due to significantly reduced size and power. Second, applying the Bonferroni correction, only non-reactivity \times condition in the final model for depression was at a satisfactory level of significance. We interpreted our findings using less stringent criterion however, given that Bonferroni adjustments tend to increase the risk of overlooking clinically significant differences. Thus, although results may reveal relevant clinical patterns, we caution the increased likelihood of these findings by chance. Third, we studied a relatively narrow range of characteristics. Thus, we caution the interpretation that homelessness, non-reactivity, and non-judging are the only predictors/moderators for African American suicide attempters. For instance, we did not assess participants' trauma history and thus do not know how it may affect intervention outcomes, which could be particularly relevant for this population and compassion-based intervention (Germer and Neff 2013; Thompson and Waltz 2008). Finally, participants predominantly were from a low social class background and we did not have much variance in socioeconomic status indicators besides homelessness. Therefore, the generalizability of the findings to individuals from other social class backgrounds may be limited.

Regarding future research, a larger trial to replicate findings from this pilot study is a necessary first step. Second, more research on predictors and moderators of intervention outcomes is needed (American Psychological Association 2006), particularly with underrepresented populations. Third, intervention research should incorporate socioeconomic status related variables (e.g., homelessness, employment, income,

housing) in the design and analysis. As socioeconomic status also reflects larger sociostructural issues, investigators may want to incorporate factors like neighborhood disorder and accessibility of resources as intervention predictors/moderators, especially when researching interventions with minority and underserved populations. Fourth, our findings suggest meaningful areas of investigation for future compassion-based intervention trials to attend. It may be valuable to further understand how mindfulness may serve as a foundation for the development of compassion. The phenomenon that individuals with lower mindfulness, specifically non-reactivity, may particularly benefit especially from compassion training for reducing their levels of suicidal ideation and depressive symptoms is also an area that may be fruitful for further investigation. Qualitative interviewing and growth trajectory analysis could help us specify intervention ingredients that enhance its effectiveness and the process of change for this subgroup.

Author Contributions SS designed the study analysis, analyzed the data, and wrote the paper. AP assisted in data analysis and editing of the paper. SBG assisted in data analysis and editing of the paper. JB assisted in writing of the Methods. JKN and AEE assisted in data cleaning, literature review, and writing of the paper. BP collaborated in data collection and study design. NJK collaborated in data analysis, writing, and editing of the final manuscript.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in the study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The Emory University IRB provided approval for this study.

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

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