

A Culturally Tailored Diabetes Self-Management Intervention Incorporating Race-Congruent Peer Support to Address Beliefs, Medication Adherence and Diabetes Control in African Americans: A Pilot Feasibility Study

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Introduction: Current diabetes self-management programs are often insufficient to improve outcomes for African Americans because of a limited focus on medication adherence and addressing culturally influenced beliefs about diabetes and medicines. This study evaluated the feasibility and acceptability of a novel culturally tailored diabetes self-management intervention that addressed key psychosocial and sociocultural barriers to medication adherence for African Americans.

Methods: The intervention consisted of group education and race-congruent peer-based phone support. Three African Americans who were engaged in taking their diabetes medicines (ambassadors), were matched with 8 African Americans who were not engaged in taking medicines (buddies). We conducted a single group, pre/post study design with African Americans with type 2 diabetes. Wilcoxon signed rank tests assessed mean score differences in outcomes at baseline compared with 6-months follow-up. Semi-structured interviews explored buddies' acceptability of the intervention.

Results: Buddies and ambassadors were similar in age and mostly female. Recruitment rates were 80% for buddies and 100% for ambassadors. Retention rate for primary outcomes was 75%. Buddies had a mean completion of 13.4/17 of sessions and phone calls. Ambassadors completed 84% of intervention calls with buddies. Although there were no statistically significant differences in mean A1C and medication adherence, we found a clinically meaningful decrease (−0.7) in mean A1C at the 6-month follow up compared to baseline. Secondary outcomes showed signal of changes. Themes showed buddies perceived an improvement in provider communication, learned goal setting strategies, and developed motivation, and confidence for self-management. Buddies perceived the program as acceptable and culturally appropriate.

Conclusion: This culturally tailored diabetes self-management intervention that addresses diabetes self-management, psychosocial and behavioral barriers to medication adherence, and incorporates race-congruent peer support from African Americans engaged in taking medicines seemed feasible and acceptable. The results provide support for a fully powered randomized trial to test the intervention's efficacy.

Trial Registration: <https://clinicaltrials.gov/ct2/show/NCT04857411>.

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Keywords: African Americans, diabetes self-management, peer support, health beliefs, medication adherence

Introduction

More than 200,000 people in the United States die from diabetes annually, and many suffer diabetes-related complications, such as cardiovascular and kidney disease.¹⁻³ This burden is twice as high among minoritized populations,



especially African Americans.⁴ In 2019, African Americans had significantly higher hospitalization and death rates from diabetes complications compared to other populations with diabetes.⁵ Medication nonadherence (ie, not taking medications as prescribed) or lack of engagement in medication taking behaviors contributes to these morbidity and mortality disparities for African Americans with diabetes.⁶ Understanding the reasons for poor diabetes medication taking behaviors among African Americans, as well as developing tailored medication adherence interventions to address factors related to non-engagement is critical to addressing diabetes disparities.

Various reasons, including African Americans' cultural beliefs about diabetes and medicines, have been linked to the disproportionate burden of diabetes among African Americans and their lack of engagement in self-management behaviors.⁷ Previous studies show that misconceptions about the cause of diabetes, disbelief about the diabetes diagnosis and the effectiveness of medicines, negatively impact African Americans' diabetes management including medication adherence.⁸ Our prior work showed that African Americans attributed curses, ancestors and medication prescribed as possible causes of diabetes and perceived that diabetes inherently developed within their family.⁸ Since these illness representations influenced by sociocultural factors may be prevalent in African American communities, more emphasis on addressing beliefs among African Americans with diabetes needs to be considered in the development and implementation of culturally appropriate diabetes self-management education programs.

Limited self-efficacy and self-advocacy in asking provider questions about medicines are also barriers to medication adherence. Conflicts often occur in patient-provider interactions when healthcare professionals have insufficient understanding of African Americans' cultural beliefs.⁹ As well, mistrust of the provider and healthcare system influenced by African Americans' discrimination experiences contributes to lower adherence to medication among African Americans.¹⁰ There is a critical need to implement diabetes self-management education (DSME) programs that address these key barriers to medication adherence among African Americans.¹¹

Current DSME programs are often insufficient in improving outcomes for African Americans because of the lack of focus on medication taking behaviors and not addressing culturally influenced beliefs about diabetes and medicines.^{12–15} A 2018 meta-analysis found no significant effect of DSME on hemoglobin A1c (A1C) in African Americans, especially at follow-up.¹⁶ Lynch et al, 2019 concluded that a brief intervention focused on medication adherence may be a more efficient strategy to achieve improved glycemic control among African Americans.¹⁷ DSME programs also are limited by not explicitly addressing psychosocial and sociocultural contributors to medication engagement, especially key factors that were demonstrated in previous findings such as self-efficacy, and racial discrimination/mistrust in the health system among African Americans.^{4,8,11,18} Incorporating critical intervention components essential to underserved/marginalized populations including positive empowerment towards engagement in self-management, and discussing how to address provider mistrust and/or improve provider communication, while delivering them with community support are needed for efficacious interventions.

DSME programs can benefit from the inclusion of available and willing supporters of African Americans who can model their adherence success, share self-management strategies based on their own experience, and discuss health beliefs. Also, DSME program success often is undermined by a lack of tailoring of content for African Americans. Tailoring established evidence-based DSME programs for African Americans increases the translation of these programs into existing community infrastructures. Our research has shown that African American peers can offer culturally appropriate psychosocial support for other African Americans who may distrust the healthcare system and may enhance patient activation towards increased engagement in medication adherence.^{19,20} Developing problem-solving skills through peer support can also motivate African Americans to improve their engagement in medication taking behaviors, in ways clinicians cannot through clinic visits alone.^{21,22} Targeting patient activation may address the lack of agency and provider mistrust common among African Americans.²² Peer support succeeds through the nonhierarchical, reciprocal, relationship created by sharing similar experiences and the tendency of peer relationships to be consistent with the individual's social and cultural beliefs.^{23,24} Race-congruent peer support is especially important and effective for African Americans who may have fatalistic beliefs about diabetes and misperception of medicines influenced by culture, family experiences, and a history of mistreatment and distrust in the healthcare system.^{25–27}

To our knowledge, this is the first study to embed a culturally tailored, race-congruent peer support program with an emphasis on medication taking and targeted at addressing culturally influenced beliefs about medicines and illness, and

distrust/provider communication into an evidence-based DSME program.^{8,28–30} We developed *Peers Supporting Health Literacy, Self-Efficacy, Self-Advocacy, and Adherence (Peers LEAD)*, a culturally tailored educational-behavioral intervention that incorporates theory-informed beliefs to target African Americans' perceptions of diabetes and medicines, address provider mistrust, and improve engagement in medication taking.^{31–33} A single-group, pre-post pilot to test the feasibility and acceptability of Peers LEAD showed the intervention's signal of effect on A1C and medication adherence.^{19,20} However, post-intervention feedback from participants and community partners suggested adding more diabetes management topics such as diet and exercise, which were not previously covered in the program. Acknowledging this limitation, we identified *Healthy Living with Diabetes (HLWD)*, a successful community evidence-based DSME program that offers tools to enhance understanding of what it means to have diabetes, lifestyle changes, and helping participants build the confidence to manage diabetes.³⁴ HLWD is proven to reduce emergency department visits by 53%, enhance participants' self-efficacy, and has a somewhat prolonged effect on A1C.^{35–37} Despite HLWD's positive outcomes, notably fewer African Americans than whites report that they take their diabetes medicines.³⁸ HLWD suffers from the same limitation's characteristic of other DSME programs, which have several implications for African Americans. Specifically, it does not offer culturally tailored content for African Americans including addressing key sociocultural barriers to engagement in medication taking, and offers insufficient attention to medication adherence, with only one 20-minute activity on medication use in the entire program.³⁷ One-on-one race-congruent peer support from another African American who successfully manages diabetes is an important factor to improve diabetes outcomes for African Americans but is lacking in HLWD.^{34,39}

Hence, we integrated Peers LEAD into HLWD, creating *Peers' Experiences in Communicating and Engaging in Healthy Living - Peers EXCEL*, an intervention that incorporates key psychosocial/sociocultural barriers to engagement in medication taking for African Americans, into an evidence-based DSME program to improve the impact of diabetes programs for African Americans.

Conceptual Framework

The theoretical underpinning of this study is based on the extended self-regulatory model, which explains how patients respond to a self-management health behavior such as medication adherence.^{40–42} According to this model, non-adherence occurs when the prescribed medical treatment does not align with the patient's perception of the disease and treatment. For patients with diabetes, taking diabetes medicines is influenced, in part, by the patient's belief about their illness and medicine. In this study, the Extended Self-Regulatory model highlights the culturally influenced beliefs about diabetes and medicines for African Americans, whereas the Information-Motivation-Behavioral skills model,^{43–46} illustrates how education, motivation for positive attitudes towards adherence via peer support, as well as developing skills for increasing self-efficacy and communication with providers can positively impact medication adherence.^{47–49} This pilot study aimed to assess the feasibility and acceptability of *Peers EXCEL*.⁵⁰ In addition, we explored if there was a signal of effect in primary outcomes: change in A1C and medication adherence. We also considered whether there was a signal of effect in secondary outcomes, including beliefs about diabetes and diabetes medications, self-efficacy for taking medications, and quality of patient-provider communication.

Methods

The Intervention

Peers EXCEL provides diabetes self-management via group education and one on one peer support. Group education includes the addition of new group sessions focused on addressing beliefs and misperceptions about medicines and diabetes, racial discrimination/mistrust, building self-efficacy, and communication with providers. The added one-on-one peer support is implemented through race-congruent phone support from other African Americans. Specifically, African Americans with type 2 diabetes who were adherent to taking their diabetes medicines (ambassadors), were matched with African Americans with type 2 diabetes who were nonadherent to taking their diabetes medicines (buddies). They provided phone-follow-ups, providing support for diabetes management by sharing/modeling successful diabetes self-management strategies.

Design

We used a single group, pre-post study design with African American buddies with type 2 diabetes. Since this was a feasibility pilot study, there was no power analysis for sample size determination.

Participants

There were six buddies who participated in *Peers EXCEL*, with three ambassadors who provided race-congruent peer support to buddies. All ambassadors were matched to buddies based on gender in a 1:1 or 1:2 pair.

Shared inclusion criteria for ambassadors and buddies included: (1) Adults aged 18–90 years old with type 2 diabetes who self-identify as African American/Black and can speak/read English, (2) Self-report being prescribed one oral or injectable diabetes medication, (3) Have access to/can use a cellular phone, tablet, or computer to join a web-based virtual meeting by video camera during the study period, (4) Diagnosed with diabetes for ≥ 1 year (obtained by self-report or verified by electronic medical record), and (5) Will reside in the geographical area throughout the study period.

Shared exclusion criteria for ambassadors and buddies included: Adults older than 90 years old.

Inclusion criteria specific to buddies included: (1) Self-reported nonadherence on the *Adherence to Refills and Medications Scale for Diabetes* (ARMS-D) scale and (2) Most recent A1c is $\geq 7.6\%$ based on information collected at point of care A1C testing.

Exclusion criteria specific to buddies were: (1) Currently participating in another diabetes lifestyle self-management or medication adherence program.

Inclusion criteria specific to ambassadors included: (1) Self-reported adherence on the *Adherence to Refills and Medications Scale for Diabetes* (ARMS-D) scale, (2) Willing to provide support to a buddy and track phone conversations, and (3) Willing to attend all training sessions and meetings related to being an ambassador.

Procedures

Recruitment

We used purposive sampling for recruitment of ambassadors and buddies from a city of about 600,000 in a Midwestern state. To recruit ambassadors, we invited ambassadors from our prior study to return and provide peer support in the same capacity.^{31,32,51} Buddies were recruited via community partner networks, radio advertisements, churches, and senior apartments, using IRB-approved passive recruitment approaches such as posting flyers in the community locations, and word of mouth. Because this study was conducted during the increased prevalence of COVID-19, we could not use active recruitment approaches such as study coordinators directly meeting with potential participants face-to-face. Potential participants were able to call the project coordinator's phone to ask for more information about the study. Each participant was screened on the phone to assess their eligibility for the inclusion criteria. Participants received a total of \$150 for completing the intervention and data collection for all clinical and survey outcomes. Informed consent included publication of anonymized responses.

Ambassador Screening: As used successfully in our pilot study,^{31,32,51} after a potential ambassador is identified, the project coordinator completes an ambassador candidate screening form. Since prior ambassadors were returning to this study, no new screenings were completed.

Buddy Screening: We implemented screening strategies as used in our prior pilot work and other studies.^{31,32,51} Potential buddies went through a two-step screening process: (1) phone screening - A study team member verified whether the individual met the eligibility criteria for being a buddy including asking whether they had a recent A1C value that was $\geq 7.6\%$. If the individual met the criteria, then a point-of-care A1C test was scheduled to verify their A1C as $\geq 7.6\%$.

Training of Ambassadors

To prepare to implement *Peers EXCEL*, ambassadors completed and attended a brief 1-hour orientation meeting to discuss the details of the new program including the intervention components, peer support phone-calls, schedule of meetings, time commitments and payments, etc. In addition, they attended a 1-hour "refresher" training meeting, co-facilitated by the Wisconsin Network for Research Support (WINRS) and the Principal Investigator (PI). The goal of this training meeting was

to review the project goals, their roles as ambassadors, and refresh their familiarity with the use of the intervention guides, manuals, intervention fidelity materials, etc. For >9 years, WINRS staff have been deeply involved in stakeholder engagement, as well as trained, planned and facilitated >250 lay advisory board meetings.^{52,53} This meeting was an orientation and prepared the ambassadors to implement specific elements of *Peers EXCEL* such as the phone calls. Similar to prior studies, the training focused on the ambassador's role as peer support persons during group sessions and phone calls, using role playing as a training approach.^{19,31,51} Though ambassadors were returning to their role, the orientation and training were critical to highlight the differences between prior peer support programs they had been involved in, and *Peers EXCEL*.

Setting

The intervention was conducted virtually.

Intervention

Peers EXCEL was an 8-week culturally tailored peer-based diabetes self-management program that consisted of group education and individual phone support with ambassadors (Table 1).

Peers EXCEL comprised of (1) two group sessions focusing on beliefs about medicines and diabetes, discrimination/mistrust, and communication with providers, and (2) peer-based phone support from ambassadors to occur weekly for the first 2 weeks, then for 5 weeks after the completion of the full 8-week program. Building on the previously piloted version of *Peers LEAD*,^{19,31,51} *Peers EXCEL* added phone-based peer support from ambassadors comprised of monthly calls to monitor progress toward goals and to support goal adherence (Weeks 15–24).

Weeks 1–8 of the *Peers EXCEL* intervention

Week 0 – Baseline enrollment: We collected all baseline measures at an in-person data collection meeting in a community location in a Midwestern city.

Weeks 1–8 consisted of 8 separate group sessions held virtually using a secure web-based meeting platform. This included one pharmacist session and one provider-led session during the first 2 weeks to discuss beliefs about diabetes and medicines, and provider distrust/communication. Community engagement and stakeholder feedback emphasized the need for a provider-led session to build trust and advance health equity.^{31,51} Diabetes self-management topics were covered by two African American HLWD-trained group leaders for the remaining 6 weeks of the program. Participants met virtually once a week in groups, for a 2.5-hour session. Ambassadors also attended the group sessions and helped reinforce the intervention content via interaction with their buddies. Attending each group session allowed ambassadors to learn together with their buddy and build social interactions.

Weeks 9–24 of the *Peers EXCEL* Intervention

Weeks 9–24: A Community Health Worker (CHW) offered each participant the option of care coordination, providing assistance for social determinants of health issues (eg, food insecurity; housing, transportation), etc.

Weeks 10–14: Beginning in week 10, ambassadors conducted five weekly phone follow-ups with buddies to further emphasize group session topics, discuss intervention topics, and provide support for maintenance of goals. During this timeframe, they reviewed the set goals and progress made, discussed any barriers to meet the goals, and collectively problem-solved ways of addressing the barriers. Buddies were able to call their ambassadors for support during these weeks, at their discretion, and ambassadors took notes about the content.

Weeks 15–24: Ambassadors made monthly calls to buddies to further reinforce content discussed during the 8-week session and provided support for the maintenance of established goals, or resetting them, if appropriate.

Each phone call from an ambassador was guided by a standardized phone call manual with detailed guidance, and a large at-a-glance call guide summarizing the detailed guidance, which were developed by the PI and WINRS.³¹ Working together with the patient advisory board from *Peers LEAD* (African American ambassadors with type 2 diabetes), prior to the implementation of *Peers LEAD*, we developed and refined training manuals, phone call guides, and phone call documentation handouts that were used in the training of ambassadors. Before the start of the program, ambassadors used these documents to prepare for their phone calls with buddies. We designed the protocol to document the phone calls based on the feedback from

Table 1 Demographics and Clinical Characteristics of Buddies (n=8)

Variables	
Age (Mean, Standard Deviation)	54 (8.6)
Gender n (%)	
Female	7 (87.5)
Education n (%)	
Some High School	1 (12.5)
High school graduate or GED	3 (37.5)
Trade school	1 (12.5)
Some college	2 (25.0)
Master's degree	1 (16.7)
Annual household income n (%)	
Less than 20,000	3 (37.5)
Equal or more than 20,000	5 (62.5)
Number of chronic illnesses (Mean, Standard Deviation)	2.3 (1.0)
Number of diabetes medications (Mean, Standard Deviation)	2.9 (1.8)
Years of diabetes diagnosed (Mean, Standard Deviation)	15.6 (10.2)
Health status n (%)	
Poor	0 (0)
Fair	3 (37.5)
Good	4 (50.0)
Very good	1 (12.5)

the ambassadors.⁵¹ During the phone calls, ambassadors provided peer support to buddies, and delivered standardized phone intervention content. Ambassadors talked to buddies for 15–30 minutes each time.

Intervention Fidelity: To evaluate the fidelity of the intervention – the extent to which the intervention is delivered as it was intended⁵⁴ – the project coordinator completed weekly phone calls to ambassadors and buddies to document the intervention content discussed during the phone call.

Approval from the Health Sciences Institutional Review Board of the University of Wisconsin-Madison was obtained for all research activities (STUDY ID: 2020–1061). Buddies provided written consent to participate. The study was registered at <https://clinicaltrials.gov/ct2/show/NCT04857411>. This study complies with the Declaration of Helsinki.

Data Collection

Measures

The primary study outcome, *Hemoglobin A1c (A1C)*, was measured using the A1cNow+ system, the National Glycohemoglobin Standardization Program Certified, CLIA-waived, system that provides results using a finger stick test. A1C was evaluated at baseline, 1 month after the completion of the first 8-weeks of the intervention, and at 6-month follow-up. A1C was tested in person at data collection meetings held in a church.

Quantitative measures. A 20-minute longitudinal paper survey measuring self-reported medication adherence and patient psychosocial factors was administered to all buddies at baseline, 1 month after the completion of the first 8-weeks of the intervention, and at 6-month follow-up. The survey was completed during the A1C data collection meetings.

The secondary study outcome, *medication adherence*, was measured using the 11-item *Adherence to Refills and Medications Scale for Diabetes* (ARMS-D) (total score range: 11–44). The ARMS-D is currently validated, convergent validity ($\rho=-0.52$) – for use in patients with diabetes taking either oral or injectable diabetes medication and is reliable – internal consistency ($\alpha=0.86$).⁵⁵

Other validated measures included (1) illness beliefs (beliefs about diabetes), measured with the Brief Illness Perception Questionnaire, a 10-item scale where higher scores represent stronger perceptions of diabetes,⁵⁶ (2) medication beliefs (beliefs about diabetes medicines), measured with the Beliefs about Medicines Questionnaire, a 10-item questionnaire with two sub-scales, necessity beliefs and concern beliefs and a score range of 5–25 for each subscale. Higher scores represent stronger concern beliefs or necessity beliefs about the medicines,⁵⁷ (3) medication self-efficacy, measured with the Self-Efficacy for Adherence to Medication Scale, a 13-item questionnaire with a score range of 13–39, where higher scale scores represent greater patient self-efficacy about medication use,⁵⁸ (4) diabetes related psychosocial self-efficacy, assessed using the Diabetes Empowerment Scale – Short Form, a 8-item scale with scores from 8–40, where higher scores indicate higher patient self-efficacy,⁵⁹ (5) patient-provider communication - Patient's Perceived Involvement in Care Scale, a 13-item questionnaire with a score range of 0–13, where higher scores stand for better communication between the patient and providers and (6) diabetes distress measured with the 2-item short form of the Diabetes Distress Scale, which has a range of scores from 2–12, with higher scores indicating greater distress,⁶⁰ and (7) depression measured with the PHQ-4, a 4-item scale with a range of scores from 0–12, with higher scores representing greater depression.⁶¹

Demographic/clinical factors including age, gender, self-reported health, and number of medications used, were also collected.

Process Outcomes

Recruitment, retention, feasibility, and adherence: To assess the feasibility of the study, we examined: (1) recruitment, (2) retention rates, (3) intervention adherence and (4) buddies' feedback about the Peers EXCEL intervention. The study goal was to aim for a recruitment rate of 80% for ambassadors and buddies. We measured the *recruitment rate* as the number of ambassadors and buddies enrolled as a proportion of our initial enrollment targets.

The *retention rate* was defined as the number of buddies who completed a point of care A1C test as an outcome assessment at 3-, and 6- months follow-up compared to the number at baseline, with a goal for 80% of participants to complete baseline A1C assessments.

We assessed the *feasibility of gathering the study outcome data* and examined if there is a signal of change in the primary and secondary outcomes. All baseline pre-intervention data including surveys and clinical outcomes were collected in the first week, and follow-up data was collected 3-, and 6-months post-intervention. With supervision of a licensed nurse, trained pharmacy students, who were study team members, completed A1C measurements as clinical indicators of medication adherence.

Intervention adherence was measured by documenting and recording the attendance of participants at each meeting, and intervention session. The number of participants who maintained their participation was compared with the numbers recruited at the onset. We also tracked the number of required phone calls ambassadors completed depending on the required frequency for the weeks in the intervention. We considered a completed phone call as a 15 minute or longer conversation between ambassadors and buddies that addressed one or more of the intervention topics.

To assess acceptability, we conducted *qualitative interviews*. Semi-structured 30-minute interviews were conducted with all buddies via secure web-based meeting platform (WebEx) after their participation in Peers EXCEL to get their feedback on the intervention and its impact on changes in medication adherence and/or diabetes self-management. Participants had similar inclusion and exclusion criteria. Two rounds of interviews were completed. The first interviews were scheduled at the conclusion of the 8-week group education to capture buddies' feedback on the group sessions, and then the second round of interviews were scheduled at the 6-month follow-up to further explore buddies' perceptions of

the phone calls with the ambassadors as well as overall feedback of the Peers EXCEL 6-month intervention, its impact, and process. All interviews were audio recorded and conducted by trained research assistants with experience conducting qualitative interviews. The interviews were then transcribed verbatim by a certified transcriptionist.⁶²

Data Analysis

Quantitative

We used descriptive statistics including means and standard deviation to summarize the socio-demographic and clinical characteristics of the study sample. Additionally, we calculated three feasibility measures related to ambassadors/buddies including recruitment of ambassadors, attrition for ambassadors and extent of ambassador participation in training and intervention sessions. The recruitment approach was considered feasible if there was recruitment of 80% of our goal for ambassadors and buddies, attrition for ambassadors/buddies is 10% or less, and the participation rate for ambassadors and buddies was 80% or higher. Using baseline and 6-month follow up outcomes, we calculated percent change for A1C, self-reported medication adherence and all other psychosocial measures (eg, illness beliefs.). Given the non-normal distribution and small study sample size, we conducted Wilcoxon Signed Rank tests to assess for differences in mean scores of outcome variables at baseline compared with 6-months follow-up. Effect size was then calculated using the Wilcoxon Signed Rank test statistics. All statistical analyses were performed using SPSS version 26.

Qualitative

For the interviews, we conducted qualitative content analysis with NVivo 12 (QSR International Melbourne) to organize and categorize the themes. We used an inductive open coding approach and compared buddies interview responses. The analytical process included an initial reading of the transcripts for data immersion; the data were read line by line allowing for the creation of codes, and themes, including the development and organization of themes and sub-themes. We created a priori codes based on the questions in the interview guide including buddies' reactions to peer support from the ambassador, reactions to the group sessions and intervention topics, as well as the phone calls with ambassadors.⁶³ Finally, we compared the similarities, differences, and connections across the themes until data saturation, when we could not infer any new dimensions within the data.^{64–66}

Two research assistants trained in qualitative research coded the transcripts independently. Then, the assistants met with the PI to discuss data similarities and divergences before an agreement was reached on all final themes. To verify the findings from the data analysis process, and establish the rigor of the data, we focused on credibility and confirmability as an analytic criterion. To ensure credibility (faithful interpretation of participant views), we used investigator triangulation – multiple coders were involved in the data analysis. To verify data confirmability (the objectivity of the data or potential congruence between the researchers), the independent coders initially met to discuss their identified data comparisons, codes, and data interpretations. Also, we resolved all discrepancies in separate discussions involving the PI, study coordinator, and the research assistants involved in the coding of the data.

Results

Demographic and Clinical Characteristics of Buddies and Ambassadors

Buddies (Table 1) and ambassadors (Table 2) were similar in age and were mostly female, but buddies had been diagnosed with diabetes for a longer length of time than ambassadors. The mean number of diabetes medications the buddies reported taking was 2.9 (\pm 1.8).

Recruitment and Retention

Eight African Americans with diabetes (buddies) initially enrolled and were paired with 3 African American ambassadors. Given the recruitment goal of enrolling 10 buddies, this represents a recruitment rate of 8/10 (80%). The enrollment goal for ambassadors was 3, for a recruitment rate of 3/3 (100%). We set a feasible recruitment rate of 80%, so, we reached our recruitment goal for the buddies and ambassadors.

Two buddies were lost to follow-up and 6 buddies completed assessment for the primary exploratory outcomes, A1C and medication adherence at all three data collection times, representing a 75% retention rate. No ambassadors were lost

Table 2 Demographics and Clinical Characteristics of Ambassadors (n=3)

Variables	
Age (Mean, Standard Deviation)	56 (12.5)
Gender n (%)	
Female	2 (66.7)
Years of diabetes diagnosed (Mean, Standard Deviation)	9 (4.6)

to follow-up, representing a 100% retention rate. We exceeded our retention goal for ambassadors based on our anticipated retention rate of 80% but did not meet it for buddies.

Intervention Adherence

Buddies had a mean completion of 13.4/17 (79%) of sessions and phone calls. All ambassadors remained in the 6-month program and completed 84% of intervention calls with buddies.

Acceptability of the Intervention

The buddies found the components and procedures of the intervention acceptable. Themes that emerged from qualitative analysis suggest that participants gained relevant information that improved their perception of and communication with healthcare providers. Specifically, buddies learned self-advocacy skills to improve their communication with their primary care providers. An example of a representative quote is:

(The pharmacist in the group sessions) just helped me understand the medicines more ... wasn't understanding why my doctor was giving it to me. And that was the lack of communication between me and my doctor. Once I started asking my pharmacist more questions, I began to ask my doctor more questions. Why are you giving me this? What is this going to help me with? ... Can I come off it down the line, things like that. – Buddy 119

Perceived Benefits of the Intervention

Benefits of the intervention, such as raising the awareness of diabetes self-management and developing individual action plans were highlighted by buddies in the interviews. Table 3 provides additional representative quotes. Buddies underscored the importance of the group discussions, which highlighted the importance of knowing how the diabetes symptoms occurred and the purpose of taking diabetes medicines. They revealed that they did not get an adequate explanation from their provider previously. The program also motivated buddies to take action to self-manage their disease by introducing the severity and possible consequences due to poor control of diabetes. One participant expressed learning about goal-setting strategies through the intervention.

I really loved when we had to break down weekly, just 3 things, where I was trying to do 300 things in a week. So make these three things a habit. You still do those three, but next week, add. You start making a habit. Those type of tools, those are useful strategies and tools. ... The advantages of (the program), the information just was amazing. I'm more aware. I pay more attention when I grocery shop. I know what I'm looking at, and I know why I'm looking at it before I put it in my cart. - Buddy 102

Intangible support from Peers EXCEL not only lasted during the intervention but led the buddies to develop potential relationships with the whole team beyond the intervention. Both emotional and informational support from ambassadors were recognized by buddies, making possible the fundamental building of a long-lasting friendship rooted in the journey of living with diabetes. Buddies also indicated that the intervention created a welcoming atmosphere for them to share their concerns with other people in the same situation and to learn from other issues that they may not have yet in their disease journey. For example, a verbatim quote from one participant stated:

Table 3 Participants' Perceived Benefits of Peers EXCEL

Themes	Subthemes and Quotes
<p>Knowledge gained from sessions improved perception of communication with healthcare providers</p>	<p>Perceived improved communication with primary care provider "... it used to be I could just go see (Drs. Name), would not ask no questions, would not say nothing. But with the Ambassador and with the Peers EXCEL, you do not have to be afraid. Just you are there, that's your doctor. It's confidential. Whatever it is, whatever you feel, that's what they are there for. And with them, it made it more comfortable for me to do that because I used to say, oh, they do not want to hear that. They do not want me asking no questions. And Ms. (Name) said, no, do not be afraid to ask questions. And I am grateful for that because if she probably had not said that, I'd just let her do what she do, check my ears and my nose and my sugar levels and went on to her next appointment. But now when I see her, I ask her questions when I used to did not." – Buddy 118</p> <p>"And so the program helped me, especially when we talked to the pharmacist. It just helped me understand the medicines more ... was not understanding why my doctor was giving it to me. And that was the lack of communication between me and my doctor. So the pharmacist helped us understand, you know, ask your pharmacist more questions. Once I started asking my pharmacist more questions, I began to ask my doctor more questions. You know, well, why are you giving me this? Okay. What is this going to help me with? And, you know, can I come off it down the line, things like that." – Buddy 119</p> <p>Learned self-advocacy "We were taught, and this is what I got from it. You are in charge, not the doctor. They are there to assist you with your tools that you need, but you are in charge of how to use those tools. And if you do not speak up, they are going to continue to go the same way, and you are never going to get healed." - Buddy 102</p> <p>"I learned I can go in there and ask them [PCPs] to look at my profile and make sure nothing in there that I'm allergic to and everything like that." – Buddy 119</p> <p>Developed a better perception of pharmacists "... helped me understand that, you know, pharmacist is just like us, working behind the counter ... she showed me that they have more information than I thought that they had. I do call and ask my pharmacist questions regarding, you know, some medicines. But the knowledge she had and the information she had lets me know that they know a lot more than what I thought." – Buddy 119</p>
<p>Participants gained new information about diabetes management</p>	<p>Questions about diabetes were answered "It's been so far, well, I mean, everyone is super nice. People are understanding. I love all their information that I have received. It's been nice to have someone to talk to regarding just, you know, bad ... I mean, just, you know, I know I first got diagnosed, it was very confusing. So a lot of my questions that I had really got answered and explained. So my experience with the program so far has been great." – Buddy 119</p> <p>"It was a lot of information in there in those, you know, things I would not think to have asked ... when I first joined, the little bit I knew, I thought, oh, I already know this. But then as, you know, the sessions went on, it was like it was so much information, so much new information that, like I said, I did not even think about before. I mean, it's a lot of good information. But I would definitely join again." – Buddy 119</p> <p>Gained new information about diabetes that they did not get from their primary care provider "They (the healthcare providers in the program) explained, you are losing the weight because you lose the potassium and everything like when you first started with your diabetes, and you do not want those numbers to go up. You want them to keep coming down and force your body to recognize ... insulin. My own doctor did not even tell me that. So that kind of pissed me off." - Buddy 102</p> <p>Gained better awareness of diabetes severity and management "I was told, once a diabetic, always a diabetic. And I do not believe that anymore ... When I first heard diabetes, I thought blindness, amputation, heart attack, all of that. Now it's like, nope, it's just something that you just have to get back, your body is out of control. Get it under control ... " - Buddy 102</p> <p>"The Peers program made me take my diabetes serious. Probably, it would have affected me to the death if it was not for this program ... The experience I have with the Peers program is it helped me a lot learning how to control my diabetes. And I thank God for the Peers program because it made me be more aware of my sickness. If it was not for this probably program, I do not know because I had a stroke in 2017 because I was not fully aware how serious diabetes is. But with this program, it allowed me to be eye opening, mindful, how to take care of myself through this program." – Buddy 118</p> <p>Participants shared self-management tips with each other "We had different age groups in there, so it was great learning from those that were ... it was great hearing from those that were older than me and even a few that were younger than me who might have known some things. I did bring (the tips of eating Bussel spouts) up in the group, and then someone said, oh, I need to add that to my diet. I would like to know how that worked out for some of them too." - Buddy 102</p> <p>Learned effective self-management goal setting strategies "I really loved when we had to break down weekly, just 3 things, where I was trying to do 300 things in a week, you know. So make these three things a habit. You still do those three, but next week, add. You start making a habit. Those type of tools, those are useful strategies and tools." – Buddy 102</p> <p>Learned about diabetes-related stress and depression "I am going to say the program and when we had to do the group sessions because we also touched on depression and everything and stress, which sometimes you really do not, you know it's there, but you do not attribute it to diabetes. You just think it's something else. But when you find out, yeah, I am depressed, and I am going through this, well, how are you dealing with it? Oh, this is what. You are like, well, I'd like to try that." - Buddy 102</p>

(Continued)

Table 3 (Continued).

Themes	Subthemes and Quotes
Improvement in participants' lifestyle	<p>"My medication has been changed since I started the program. I am also changed my diet. I started to work out. It lifted me up. It gave me motivation to really go forth with my health as far as eating healthier and, you know, just being better, having better changes and just a new outlook on everything ... I learned more about the different fats and things like that by talking about nutrition ... I even started going to a dietitian because my insurance covered it because after talking to my insurance carrier, I felt there was a lot of things that they covered dealing with diabetes." Buddy 119</p> <p>Improvement in medication belief and use</p> <p>"... before I started the program, I was very iffy about taking my medicines because I thought that one medicine was making my body react to it, then I have to go on another medicine. And I was iffy about taking the medicines. It seemed like they were trying to give me more medicines. And so the program helped me, especially when we talked to the pharmacist. It just helped me understand the medicines more. And, you know, then I started understanding, if I take these medicine but, at the same time, do what I am supposed to do, as far as eating right, exercising, things like that, I can come off those medicines. So it just helped me understand that, you know, taking the medicines pretty much helping me. They are not harming me, you know, as long as I take them right." – Buddy 119</p> <p>"It was kind of hard for me to take medication like I was supposed to. The way it helped me the most, taking my medication like I'm supposed to. So that's a plus." – Buddy 121</p> <p>Improvement in physical activity</p> <p>"And then the fact that a few of us do have active things that we can do as a group is, right, I would love to meet up with, because I am not really a walker, but I will meet up and walk with them, because we are going to be talking and getting to know each other." – Buddy 102</p> <p>"I learned a lot. Just the overall, I liked the activities she did with us to keep us active. I learned to factor it into my day, no matter what. And I did. I fit it, and I did it three times a week. My confidence feels where I was high, so, yeah. I started to walk more, and then I started play basketball more." – Buddy 119</p> <p>Choosing healthy food options</p> <p>"The advantages of it, the information just was amazing. I'm more aware. I pay more attention when I grocery shop. I know what I'm looking at, and I know why I'm looking at it before I put it in my cart." - Buddy 102</p> <p>"... if it were not for the Peers program, I never would have knew how important it was, you know, for the calories, for the sugar. I never would have been aware of that. I just get stuff. But now I read the labels. I read the labels, and that's because of the Peer program. Because never, did not nobody ever tell me to read no labels." – Buddy 118</p> <p>Perceived improvement in blood sugar</p> <p>"... my blood sugar used to be 300, almost 400. But now it's done to like 100, 160." - Buddy 118</p> <p>"I will say the motivation, as far as helping me stay on task with everything, as far as exercise and everything, my medicine. It helped me lose weight. My sugar is on a good level now, you know. I would say that was the best part." – Buddy 119</p>
Provided opportunities for accountability, motivation, and confidence building	<p>"Also, holding me accountable You are accountable for three things, and they are easy-to-do things. And if I could not do those three, then I am failing myself ... I had to decide, do I want to do it and succeed, or do I want to do it and fail again? Did not cost anything. I could still use it after the program. So that's where you are. Eating three times, eating my meals at least three times a week. Now I eat breakfast at least seven days a week." - Buddy 102</p> <p>"With the program, it gave me more confidence being in the Peers program because before the Peers program, I did not have confidence. I did not have confidence in myself. I did not have confidence with my health because like I am alone ... They built my confidence up. The Peers program really have helped me a lot expressing my diabetes because I do talk about it, even if the other people do not want to show interest. – Buddy 118</p> <p>"I will say the motivation, as far as helping me stay on task with everything, as far as exercise and everything, my medicine. It helped me lose weight. My sugar is on a good level now, you know. I would say that was the best part." – Buddy 119</p> <p>"I like the sessions ... I really like to talk about things that can be helpful to me and others ... I am truly one that would like to continue participating because it helps me ... It really helps my motivation. It helps me understand that, well, somebody care about you, so you have to care about yourself. So it helps." - Buddy 118</p>
Provided a unique opportunity for shared experiences, understanding, and support for people with diabetes	<p>The comfort of not feeling alone in managing diabetes</p> <p>"It went well because it got me involved and interested in some things with the topics that y'all brought up that made me mindful of like, oh, wow, oh, that's me sometimes. And sometimes I have said, I will say, sometimes I do get depressed, and I do not know. But with the sessions helping me walk through it, kind of made me think, keep myself busy and go socialize, so I will not be getting that moment of giving up." – Buddy 118</p> <p>"You have got somebody there. You are not alone. This group, I am not alone. I am unique. We are a unique group because of what we have. So I have somebody that understands what I am going through when I have family and friends ... You need somebody to tell you, oh, you are doing fine. Keep up the good work, or this is where you might want to change something ... when you have people like this, which I hope we were able to get personal friendships as well, they get it, you know. They can understand when you are depressed. They can understand. Oh, come on, let us get you out of the funk. Let us be a team together. And we help each other." – Buddy 102</p> <p>"I feel comfortable when I come around you guys because everybody knows what we are striving for, so it makes me comfortable when I talk about my diabetes than to talk about it with friends and family ... you feel a little more comfortable with somebody that's going through the same thing that you are going through and open to talk about it, instead of just thinking, oh, maybe they are going to think something is wrong with me. Just being around the same people like me that's sick, and we could talk about our issues." – Buddy 118</p>

(Continued)

Table 3 (Continued).

Themes	Subthemes and Quotes
	<p>An opportunity for shared experiences to build lasting relationships/friendships with other peers with diabetes</p> <p>"They are a special group, and I really wish we did not have COVID because I know we probably would have had a chance to meet up together, share recipes, and may have formed possible friendships along the way because somebody gets it. I get it when you are feeling a certain way. Or I can look at you and say, hey, you are looking, is your sugar okay? Let us check your numbers." – Buddy 102</p> <p>"It might be an issue with their diabetes that I might not have. And then it might be an issue with their diabetes that I might not, that they might not have, and we talk about it and share. So that way, everybody's eye is open ... if I feel like this, that means that. But if you were not around people that experienced that, you would not know. You would not even know why you feel like that. But when you be around groups and people talking about the same thing that your issue is, you can relate a little better because that's like with the cookies and the ice cream that we used to go to the meetings, and we'd be in groups, and everybody, you got two or three people in that group, two or three people in that, and everybody expressed what they was going through." – Buddy 118</p> <p>Ambassadors provided emotional support and motivation</p> <p>"Well, we were not judging each other. He [ambassador] was not judging. He always asked me, you know, how are things going? And I was, I could not wait to tell him about my new results. He was like, you know what, when you hear about people who's really pushing and going for it, it encourages you. You are encouraging me as well. He's comfortable to talk to. It's not like he was like, okay, let us go through this list. It's going to be one of those calls, you know. So it was not anything like that. So it was like I knew him. I have known him for a while. That's how I felt." – Buddy 102</p> <p>"She's [ambassador] very comfortable to talk to. Like I said, I am more of a quiet, shy person. So it was not hard to talk to her. She's very nice. She already had like questions she wanted to ask, you know, ask. And, you know, so she was not nose or anything like that or asking too much or getting too deep or nothing like that. I did not feel uncomfortable at all during our conversation. And she was very helpful. I feel like she kept me motivated ... she was motivating me to keep doing, you know, what I was doing. Asking me what the, you know, some of the things I was eating. A little bit of what I can change as far as what I was eating. Encouraged me to talk to my doctor about some of the feelings I was having after I eat certain things. You know, encouraged me to talk to him about my medicine and, you know, just things like that." – Buddy 119</p> <p>"She [ambassador] just pretty much helped me with, you know, focus with my medicine because, like I said, it was a little bit iffy for me. So she just encouraged me, you know, regarding my medicine, encouraged me to ask the pharmacist questions. You know, we will talk about situations, or I share with her, but then she will, you know, encourage me to talk to my doctor about certain things and, you know, reminders of the meetings and things like that." – Buddy 119</p> <p>"But with the Peers EXCEL and Ambassador making me mindful, Ms. PB 118, have you went to the store? Have you read the labels? Adrienne tell me that all the time. Ms. PB 118, you been reading your labels? You know, and I was like, man, that's a blessing that she cares, and it makes me mindful when I go to the store. I have my little glasses, and I look. I used to did not. So yeah, they helped me a lot." – Buddy 118</p> <p>Research team provided support</p> <p>"They [research team members] showed compassion for me, and I appreciate that. With the Peers program, it's like I am in a relationship with them, and I am grateful for that because even with them just, oh, I just called to see how you are doing, oh, my God, it just, it touches me, brings tears to my eyes because they thought enough to check on me ... So people still in the EXCEL Peer program, they did not leave me out hanging, and I am grateful for that ... It made me feel special." – Buddy 118</p>
<p>Program provided access to additional resources</p>	<p>Access to resources to manage diabetes better</p> <p>"I have someone to call. I have someone to email. I have someone that I would ask ... I am able to reach out to them, because I have a resource. Prior to that I had nothing. I had nobody, no one with the education of these diabetes I could call one of you guys if I have a problem, and y'all will put me with somebody that can help me. So I kind of liked that ... I am grateful that you guys take time out of your life to help somebody like me." – Buddy 102</p> <p>"I could call one of you guys if I have a problem, and y'all will put me with somebody that can help me. So I kind of liked that as well because when you do not know who to talk to, you do not know what to do. But when you find a source that helps you with your situation, you can appreciate it. I know I do, you know, because I am grateful that you guys take time out of your life to help somebody like me." – Buddy 118</p> <p>Access to the program book to supplement information shared in the sessions</p> <p>"The good thing is the book. I got a good book, a lot of references and resources in it that I can always go back to, once we broke it down on how to use the book, which is very important. You can give anybody anything. But if you do not show them how to use it, it's a waste." – Buddy 102</p>
<p>Cultural appropriateness of the program</p>	<p>Participants gained an awareness of the prevalence of diabetes in AA communities</p> <p>"Letting people know how to take care of their diabetes with the people that's having advantage of knowing how to prepare the people that do not know how. It helped me within my culture because Black people have so much. I did not know so many Black people were type II diabetics. And with the sharing of what y'all know and sharing with the people that do not know seemed to help my culture because I did not, there's a lot of things about that, being at the time, before I got into the program, I was not aware of." – Buddy 118</p>

(Continued)

Table 3 (Continued).

Themes	Subthemes and Quotes
	<p>"I do not know why I thought black people do not get type II diabetes, or white people dealt with type I diabetes. I do not know why I thought that, but that was something I thought. But, you know, through the program, I realized it was actually both white and black people dealing with the same, you know, type diabetes. I do not know. It just seemed like I know a lot of white people that has it. So to me, I mean, how much it helped me, and a lot of things that I did not know, coming through the program, you know, it just tells me there's ... lot of black people out there dealing with the same issues and do not know the information ... I just think education is a big part of, that's what this program gave me." – Buddy 119</p> <p>The information in the program book was useful for AAs and helped with follow-up on education received</p> <p>"I mean, just help with, the book itself, as well as the sessions, it helped, you know, to follow along with everything that was, all the information. And then you had it to, you know, look over again afterward. It's just a lot of information that, you know, us as African Americans did not, do not get, shall I say, on information that was shared, that actually, there was questions in there that I did not even know. It was questions and answers that was shared that I did not think to even ask or even wonder about that was answered. So it was a lot of information that was shared, especially in the book." – Buddy 119</p>
Excellent program delivery	<p>Professional delivery of the program sessions</p> <p>"I think it was ran great. I mean, they was, it was like teamwork. I remember sometimes everybody did not come and nothing, so it was really still, you know, willing to go ahead with the meeting for everyone else. I think there was a time or two that they had to cancel, but I mean, for the most part, she went ahead with the information for the ones that did log in and give information to the ones that wanted it, or to, you know ... it was a time that Ms. (Name) was running a little late, and Ms. (Name) went ahead and started the meeting for her. She did a great job. So I think it was ran great. It was on time, very professional." – Buddy 119</p>
	<p>Online setting was convenient</p> <p>"I was able to do the meeting and still be home and do what I have to do because I was on the meetings on my cell phone." – Buddy 119</p>
	<p>Online setting allowed for family of participants to also learn from the program</p> <p>"I got, you know, a lot of information from it, got into it, and, you know, got a hang of the program, it was fun. I enjoyed it, and it was times that I would log on, and me and my kids was out, and I will plug the ... to the speaker. And because I, you know, I have respect for my kids, but, you know, the sessions was about, so we all participated. They all listened because, you know, I want them to understand as well what diabetes is, and it runs in our family. And, you know, I want them to eat healthy as well and do better as far as their diet. So they did not mind participating." – Buddy 119</p>
	<p>The sessions were engaging and welcoming</p> <p>"... they made you comfortable They did not sound like they were reading from a book. Even though we had PowerPoints, you can see it, you know. And they asked our opinions, our thoughts on things. That was important. It was not like you do what we say do ... So she [pharmacist] was very informal with us. That's what I liked about it." – Buddy 102</p> <p>"My experience was really good. I mean, everybody made me comfortable as far as speaking about my medical, you know, as far as like ... high blood pressure even. As far as the way they [healthcare providers] explained things, especially in the meetings ... it was easy to follow along. Everything that was explained was very understandable. It was not confusing or, you know, unorganized. It was very professional." – Buddy 119</p>

When you have people like this, which I hope we were able to get personal friendships as well, they get it, you know. They can understand when you're depressed. They can understand. Oh, come on, let's get you out of the funk. Let's be a team together. And we help each other ... (And my ambassador) wasn't judging. ... He was like, you know what, when you hear about people who's really pushing and going for it, it encourages you. You're encouraging me as well. He's comfortable to talk to. It's not like he was like, okay, let's go through this list. – Buddy 102

In terms of the intervention content, format and delivery of the program, buddies perceived that Peers EXCEL provided appropriate resources, culturally tailored content, and an engaging delivery of the intervention to equip African Americans with diabetes self-management skills. Buddies thought that the program book was useful as a reference and resource for disease and medication information, which would be important to use after the group sessions ended. Buddies also expressed appreciation that support from peers was always there to make them feel comfortable to ask questions. A representative quote from a participant was:

I could call one of you guys if I have a problem, and y'all will put me with somebody that can help me. So I kind of liked that as well because when you don't know who to talk to, you don't know what to do. But when you find a source that helps you with your situation, you can appreciate it. – Buddy 118

In addition, buddies perceived that the group sessions increased their awareness of the prevalence of diabetes in African Americans as well as provided self-management information tailored for an African American individual with diabetes.

Through the program, I realized it was actually both white and black people dealing with the same type (of) diabetes. So to me, it just tells me there's ... a lot of black people out there dealing with the same issues and don't know the information ... I just think education is a big part of, that's what this program gave me. –Buddy 119

Specific to the intervention delivery, buddies noted that the team created an engaging, professional, and welcoming atmosphere to provide diabetes self-management skills in an online setting. Buddies perceived Peers EXCEL as a well-organized, information-rich program that integrated education and support from healthcare professionals, peers, and the research team. Other positive aspects of the online delivery format included enabling buddies to share content with family and be more flexible to participate and fit attendance into their daily schedules. Also, the interactive learning environment allowed buddies to feel safe to ask questions, engage and feel comfortable sharing.

(The program) made you comfortable They didn't sound like they were reading from a book. Even though we had PowerPoints, they asked our opinions, our thoughts on things. That was important. It wasn't like you do what we say do ... So she [pharmacist] was very informal with us. That's what I liked about it. -Buddy 102

Intervention Challenges and Recommendations

Buddies noted some challenges related to the logistics of the program implementation and included suggestions for future improvement. For example, some buddies noted unequal commitment to participation from other buddies which led to the cancellation of one of the group sessions. Another challenge mentioned was the length of the group sessions, which was especially hard to accommodate on a weekday. A representative quote was:

At first, I felt they were too long because I get off work at 5:00, and to be honest with you, this is the most talking I do right after work. I work on the phones, and I'm quiet for hours afterwards. I just don't want to hear myself talk. So getting in there and I'm like I'm here, but don't ask me to say much. - PB 102

There were some suggestions for reminders and refreshers regarding the schedule of Peers EXCEL. Some buddies thought that a friendly reminder of the group sessions may promote participation rates. They also wanted more emphasis on the information and resources after the group sessions. This is to ensure that they did not miss any information while they are dealing with other daily life challenges. Table 4 provides additional representative quotes.

Table 4 Challenges of Peers EXCEL

Cancellation of sessions	"We ended up missing a class because some people weren't there. Well, you know, life goes on. Focus on the ones that are here in that case." - Buddy 102
Timing and duration of sessions	"At first, I felt they were too long, because I get off work at 5:00, and to be honest with you, this is the most talking I do right after work. I work on the phones, and I am quiet for hours afterwards. I just do not want to hear myself talk. So getting in there and I am like I am here, but do not ask me to say much." - Buddy 102
Preference for text message for session reminder	"Then I started getting the phone calls. Well, I am at work, and I would miss the calls, because I cannot answer this call right now. So sometimes a good text would have been fine, just a friendly reminder, you have your class tonight. You know, a text message I would have seen that, been like, yeah, got it."- Buddy 102
Need for refresher courses and reminders about resources covered in previous sessions	"December's coming up ... I do remember we talked about, you know, dealing with depression, holidays, meals, and things like that. I would like to get a brush up on that, because I know they said in there something you can do or someone you can contact. That information may have been in that PowerPoint, and I did not write it down. Or if I know other people who want to do it, yeah, here's the number. I can go in there and get that and give it to other people." – Buddy 102

Table 5 Baseline to 6 Month Changes in Clinical and Psychosocial Outcomes (n=6)

Outcome	Mean (SD)		Percent Change	Effect Size
	Pre	Post		
Primary Outcomes				
Hemoglobin A1c	10.4 (1.7)	9.67 (2.9)	-7%	0.39
Medication nonadherence	19.2 (7.3)	17.5 (4.3)	-9%	0.06
Secondary Outcomes				
Blood Pressure, Systolic	146.5 (19.1)	140.4 (20.7)	-4%	0.30
Blood Pressure, Diastolic*	92.4 (10.7)	95.9 (12.2)	+4%	0.51
Necessity of taking medicines	19.3 (3.6)	20.7 (6.1)	+7%	0.43
Concerns about taking medicines	15.5 (3.7)	14.5 (4.7)	-7%	0.28
Negative beliefs about diabetes	43.3 (7.0)	42.2 (19.0)	-3%	0.04
Self-efficacy	23.2 (8.9)	31.3 (5.0)	+35%	0.39
Patient Provider Communication	17.7 (3.2)	17.0 (3.1)	-4%	0.13
Diabetes Distress	5.8 (3.3)	6.0 (3.2)	+3%	0.15
Diabetes Empowerment	24.8 (8.9)	33.2 (6.1)	+34%	0.77
Depression	6.6 (3.1)	3.7 (2.7)	-44%	0.39

Clinically Significant Signal

There were no statistically significant differences in mean A1C and self-reported medication adherence scores at the 6-month follow up compared to baseline (Table 5). However, the 0.73 decrease in A1C reflects a clinically meaningful improvement in mean A1C.⁶⁷

Although not statistically significant, there were notable improvements in some secondary outcomes, including an increase in buddy's self-efficacy (+35%), and diabetes empowerment (+34%) and a reduction in depression (-44%) (Table 5).

Discussion

This study evaluated the feasibility and acceptability of the *Peers EXCEL* intervention by integrating a culturally tailored program to increase engagement in taking medications for African Americans with diabetes into HLWD, a long-standing, evidence-based DSME program. *Peers EXCEL* aimed to address culturally specific barriers to African Americans' engagement in medication adherence such as mistrust of providers, and beliefs about diabetes and medicines.^{28,32}

In this study, we exceeded both the recruitment and retention goals for ambassadors. We also met our recruitment goal of 80% for buddies but did not meet the retention target of 80%. A possible explanation for not achieving the retention target might be the virtual setting of the program due to COVID-19 pandemic, which could be a less ideal way to deliver a diabetes self-management program.⁶⁸ Nevertheless, buddies and ambassadors were adherent to the intervention, confirmed by a high rate of completion of group sessions and phone calls and being engaged during the 6-month program.

The study aimed to detect a signal of change in primary outcomes such as A1C, medication adherence, beliefs about diabetes and diabetes medications, self-efficacy for taking medications, and quality of patient-provider communication. Based on this objective, we did not conduct a power analysis to determine sample size, so we did not expect to find statistically significant quantitative results after the intervention. Future fully powered randomized controlled trials are needed to demonstrate statistically significant improvements in clinical outcomes.

Results showed a clinically meaningful reduction of mean A1C as well as improvements in self-efficacy and diabetes empowerment. The change in A1C, though not statistically significant, may be reflective of improved engagement in

medication taking over time. A randomized controlled trial which compares Peers EXCEL with the HLWD program alone is needed to further assess if there is a significant difference in A1C and an improvement in medication adherence between the evidence-based DSME and the tailored intervention.

The results showed that participants perceived increased empowerment and successful development of behavioral strategies to self-manage diabetes. Similar to a previous review, this study found that group-based programs with discussions with other peers with diabetes led to an improvement in knowledge about diabetes self-management skills.⁶⁹ The qualitative results showed buddies gained self-management information and tips from their peers (including ambassadors), including experiencing lifestyle changes in diet and physical activity.

Equipping African American patients with the ability and skill to self-advocate and communicate with healthcare professionals is another core element of diabetes empowerment within diabetes self-management programs.⁹ Facilitated by a physician and pharmacist in separate group sessions, the program may help build trust among African American communities and providers as the participating providers answered disease and medication-related questions that had not been addressed by buddies' current providers.

The qualitative results provide more details about how and why improvements may have occurred in depressive symptoms and beliefs about medicines. With a reduction in depression, buddies perceived the emotional support from ambassadors created a feeling of belonging, and the development of peer friendships during the program. As well, buddies felt motivated to want to build their own self-management skills. Stress management and discussing depression was an added content to the prior peer-supported tailored medication adherence program for African Americans. Peers EXCEL may show a positive impact on buddies' psychological outcomes in a fully powered trial. In addition, the quantitative results showed an improvement in beliefs about the necessity of taking medicines, as well as a reduction in concerns about taking medicines. The qualitative findings supported these changes in beliefs about disease and medicines. As well, buddies mentioned an appreciation of the cultural tailoring of the program to African Americans. Culturally appropriateness of a program has been suggested as a key determinant needed for diabetes self-management programs to address beliefs about diabetes and medicines in African American communities.¹¹

The cultural tailoring of the Peers EXCEL program is also reflected in buddies' acceptability of the program delivery. Related to tailoring, buddies discussed the inclusion of culturally tailored content in the group sessions which increased their awareness of diabetes prevalence in the African American communities, allowed for a discussion of provider mistrust, and the role of family in disease management. Since these factors have been shown in prior work to influence medication adherence and self-management among African Americans, they may need to be strategically included in DSME programs for African Americans.^{4,8}

Previous studies report that African Americans with diabetes have significantly higher morbidity and mortality rates compared to non-Hispanic whites with diabetes.^{1-3,5} It is well known that these disparities in health outcomes may be due to mistrust of healthcare providers, negative cultural beliefs about diabetes and diabetes management and lack of engagement in medication taking among African Americans. Although many evidence-based programs have been developed to enhance patients' diabetes self-management skills and improve health outcomes, limited attention has been placed on culturally adapting these interventions to meet the unique needs of African Americans. There is a critical need to address sociocultural barriers to adherence and diabetes self-management to address diabetes disparities in African Americans.

This study had some limitations. Recruiting enough African Americans to meet our recruitment goal was challenging. Recruitment was limited due to the COVID-19 pandemic, which restricted active engagement with our community partners, and we could not use active recruitment approaches such as study coordinators directly meeting with potential participants face-to-face. Though participants appreciated the convenience of virtual meetings, there were some retention issues, possibly due to the virtual delivery of the intervention. We showed a signal of change in the exploratory outcomes of medication adherence and A1C. However, the results should be interpreted with caution as we had a small sample and no control group. Most of the participants in this study identified as female. Prior research has shown females are more likely to participate in self-management programs compared to men. Our future research will consider recruiting more male facilitators and ambassadors and target recruitment locations where we are likely to engage with African American men (eg, barber shops).

Conclusion

This culturally tailored diabetes self-management intervention that addresses diabetes self-management topics, psychosocial and behavioral barriers to medication adherence, and incorporates race-congruent peer support from African Americans who are adherent to taking medicines seemed feasible and acceptable. African Americans with type 2 diabetes who participate in evidence-based diabetes management programs may benefit from added discussion on beliefs about diabetes and medicines, and one-on-one weekly peer support from an African American adherent to their diabetes medicines. The results provide support for a fully powered randomized trial to test the efficacy of the intervention.

Abbreviations

A1C, Hemoglobin A1c; COVID-19, Coronavirus.

Data Sharing Statement

Data may be shared upon request from the corresponding author, Olayinka Shiyanbola.

Ethics Approval

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Health Sciences Institutional Review Board of the University of Wisconsin-Madison.

Consent to Participate

Received from all participants.

Consent for Publication

Received from all participants.

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Disclosure

The authors have no relevant financial or non-financial interests to disclose.

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