

Design of a mobile mental health stigma reduction application for Black adults with depression and anxiety: User centered design

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Submitted to: JMIR Formative Research
on: April 28, 2025

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Table of Contents

Original Manuscript.....	5
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Abstract

Background: Black people represent 13% of the general population, but nearly 20% of people living with mental illness. Mental illness is heavily stigmatized, due to factors such as fears of appearing weak or being unable to function. Mental health service utilization remains low, among Black adults in the U.S. Stigma is characterized by negative attitudes or beliefs about mental illness.

Objective: Our study's primary goal is to develop a video-based anti-stigma intervention app, that unifies principles of stigma reduction based on contact while simultaneously addressing medical mistrust based on perceived shared identity with a peer narrator (across race, religiosity, generational status, and ethnicity). The rationale for this approach is that anti-stigma interventions that simultaneously address medical mistrust with health systems may have enhanced efficacy in producing behavior change.

Methods: We employed a user-centered design (UCD) approach to develop a prototype and assessed the usability of the prototype utilizing qualitative methods. UCD refers to a set of methods that gives voice to end-users (i.e., people for whom the final prototype or intervention is designed) in the design of digital health technology.

Results: Our analysis of the data revealed five major themes in elicitation interviews and lab design workshops: 1) optimal mobile application preferences for technical and service features; 2) use of narrative storytelling from a firsthand concordant perspective and the psychological effect of storytelling; 3) integration of storytelling into a mobile app platform; 4) the role of mental illness stigma; and 5) experience of mood related symptoms, and use of mental health systems. Field testing exit interviews were brief focused on final refining of completed prototype.

Conclusions: In this qualitative study of Black men and women with moderate to severe anxiety and/or depression, most voiced appreciation for a mobile mental health app that curated firsthand narratives to promote understanding of mental health care. The app offered a contact based learning platform for reducing mental illness stigma and improving mental health treatment engagement. Thus, the app prototype offered a novel resource to participants who, despite meeting screening criteria for moderate to severe depression or anxiety, were not receiving any routine mental health services.

(JMIR Preprints 28/04/2025:76676)

DOI: <https://doi.org/10.2196/preprints.76676>

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Original Manuscript

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Word count: 5462

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Funding acknowledgment: ABP reports funding from U.S. National Institutes of Health (NIH) K23MH128535. ACT reports funding from NIH K24DA061696.

Disclosures: ABP reports receiving financial compensation for educational consultation from Otsuka, Apple Inc, and Quality Interactions. ACT reports receiving a financial honorarium from Elsevier for his work as Co-Editor in Chief of the Elsevier-owned journal *SSM – Mental Health*.

Keywords: user centered design, Black people, stigma, medical mistrust, videos, storytelling

Introduction

Black people represent 13% of the general population, but nearly 20% of people living with mental illness^{1,2}. Mental illness is heavily stigmatized, due to factors such as fears of appearing weak or being unable to function. Mental health service utilization remains low, among Black adults in the U.S. Stigma is characterized by negative attitudes or beliefs about mental illness, or negative behaviors directed toward people with mental illness (PWMI), and may be held by PWMI or the general public^{3,4}. As such, stigma compounds disabilities related to the primary symptoms of mental illness, inhibits mental health care-seeking behavior, and increases morbidity and premature mortality related to mental illness⁵⁻⁷. Medical mistrust,—defined as a belief that an entity such as a health care provider or hospital system is working against one's best interest or wellbeing,—is another factor that undermines Black people's engagement in mental health services⁸⁻¹⁰. This medical mistrust in the Black community is rooted in the US's historical legacy of unethical experimentation on Black people, reinforced by refractory, interlocking systems of discrimination occurring in the present day^{11,12}. However, in the current literature¹³⁻¹⁶, well-established research emphasizing that having racially concordant health professionals with shared identities (across race, gender, or religion) can enhance communication and trust and reduce hesitancy toward accessing mental health services. For example, patients feel more willing to share information with their doctor based on patient's perception of shared values¹⁵.

Patient-provider concordance has been studied. However, the field of stigma reduction lacks research on the effects of having racially concordant peers, sharing their lived experience narratives with mental illness to reduce stigma, address mistrust, and enhance engagement with mental health services^{5,17}. Designing culturally tailored interventions that can simultaneously reduce stigma, address medical mistrust, and optimize mental health service engagement for underserved

populations is sorely needed. Yet very few interventions combine these components to engage Black patients in needed mental health care.

Digital mental health platforms offer a delivery mechanism for anti-stigma interventions that can be modified and tailored to fit the real-time needs of underserved Black people and can be scaled for broad access given the popular use of smartphones (87%) in the population ¹⁸. Stigma reduction is founded on well-established sociological and psychological theories of behavior change that positive and voluntary contact ¹⁹ with PWMI (e.g., in which they can share their personal narratives of diagnosis, treatment, and recovery) may effectively reduce stigmatizing attitudes and behaviors ²⁰⁻²². Successful contact interventions are: targeted (i.e., with a specific outcome, such as the use of mental health services), local (within a geographical region such as an urban setting), credible (i.e., to the target group -- which can be facilitated by racial concordance), continuously delivered (i.e., more than a single point of contact), and involve direct contact with the patient ²³. Contact can be either face-to-face or video-based (digitally delivered). Meta-analyses have consistently shown that both face-to-face and video-based contact with PWMI can reduce stigma ^{5,8,24,25}. Face-to-face interventions are resource-intensive and often require professional or peer facilitators, which significantly limits scaling, dissemination, and implementation goals ²⁶. Barriers around the delivery of face-to-face anti-stigma interventions may be addressed by the use of digital mental health technology to deliver video-based interventions ²⁷⁻²⁹. For example, in some studies, repeated exposure to pre-recorded videos has been shown to be as effective as live presentation in changing patients' willingness to use mental health services, indicating that contact can be extended across geography and time ^{5,27,29-31}.

While there has been a large body of work in this area synthesized by systematic reviews and meta-analyses on anti-stigma interventions ^{5,32}, other investigators in the field have called for more culturally informed or tailored approaches to the design of anti-stigma interventions ^{5,25,32}. This background literature forms the foundation for our study's primary goal, which is to develop a video-based anti-stigma intervention app, that unifies principles of stigma reduction based on contact

while simultaneously addressing medical mistrust based on perceived shared identity with a peer narrator (across race, religiosity, generational status, and ethnicity)³³. The rationale for this approach is that anti-stigma interventions that simultaneously address medical mistrust with health systems may have enhanced efficacy in producing behavior change^{9,34,35}.

Methods

We employed a user-centered design (UCD) approach to develop a prototype and assessed the usability of the prototype utilizing qualitative methods^{15,36}. UCD refers to a set of methods that gives voice to end-users (i.e., people for whom the final prototype or intervention is designed) in the design of digital health technology^{36,37}.

Recruitment took place through outreach to community partners, who shared the study proposal with community members. We included Black adults: 1) with moderate to severe depression (9-item Patient Health Questionnaire³⁸ (PHQ9) score ≥ 10) or anxiety (7-item Generalized Anxiety Disorder scale³⁹ (GAD7) ≥ 10), 2) who were not in routine mental health care in the past year, 3) aged 18-45 years, 4) who spoke English, and 5) who owned a smartphone and had Internet access. We excluded anyone who: 1) had visual, hearing, voice, or motor impairments that would prevent engagement in study procedures, and/or 2) with a diagnosis of a psychotic disorder or severe suicidality for which participation would be inappropriate.

We employed an iterative UCD approach to ensure design elements were tailored and specific to the needs of end-users. We assessed the service design (refining the actual components e.g. narrative content, video length) and technology design elements (ensuring the technological features are user-friendly e.g. app display, log on features)^{36,40}. We used a 3-step UCD approach to design the final prototype. This involved key informant elicitation interviews (n=8), from which we designed a working prototype. Then, we completed two rounds of refining the prototype through iterative design workshops. As part of the design workshops, we assessed design elements in a lab

setting (n=5). The key informant interviews focused on eliciting participants' understanding of depression, anxiety, and the stigma and medical mistrust associated with those symptoms to develop low fidelity prototypes. The iterative design workshops used a prototype feedback model using a prototype that included short video clips and images with narratives of illness and recovery. The videos used during the key informant elicitation interviews, laboratory-based design workshops and field based testing included a real patient describing their narrative of illness (depression and anxiety), treatment, and recovery.

Data were collected between January 2023 and April 2024. We conducted 26 one-on-one key informant interviews (1-2 interviews per participant) with 17 unique Black adults experiencing moderate to severe depression or anxiety, stopping data collection once data saturation was achieved in the major themes. It generally takes approximately 9 individuals to identify 95% of usability problems.⁴¹ We assessed participant impressions of constraints, context, and acceptability of the prototype at each stage. We provided \$25 in study incentive for each step completed (up to \$75 total).

To analyze the data, we used thematic analysis on all completed interviews. Using Dedoose software, transcripts were coded through iterative identification of themes, systematic coding, comparison, and interpretation of findings⁴². We reviewed transcripts using a six-step analytical approach⁴². First, all responses were independently examined by at least two coders (ABP, JB, BA), who included two doctoral-level researchers and one master's-level individual. All coders identified as Black women. Second, we used line by line coding to identify important meaning units. Third, we used the meaning units to identify relevant codes, which were then grouped into higher order codes and themes. Fourth, coders met regularly to generate a code book. Fifth, the coded transcripts were reviewed for consistency between coders. Sixth, inconsistencies were discussed, and codes were revised until we reached an intercoder reliability ($\kappa > 0.80$). In thematic analysis, current theories and prior research are used to develop concepts

The study was approved by the [Blinded for Peer Review] Institutional Review Board. Prior to study activities, participants provided written informed consent. All data collected from participants was stored in university approved secure files.

Results

The demographic characteristics of the sample are described in Table 1.

Table 1. *Demographic characteristics of study participants*

Demographic characteristics		N	%
Age			
	18-24 years	5	29.4
	25-35 years	7	41.2
	36-45 years	5	29.4
Sex			
	Male	4	23.5
	Female	12	70.6
	Other	1	5.9
Marital Status			
	Unmarried and living with a romantic partner	2	11.8
	Never married	13	76.5
	Separated	1	5.9
	Divorced	1	5.9
Ethnicity			
	African American	11	64.7
	African immigrant	2	11.8
	Afro-Latina/o	2	11.8
	Afro-Caribbean	2	11.8
Education			
	Less than high school	1	5.9
	High school diploma/GED	2	11.8
	Trade school/vocational degree	1	5.9
	Some college, no degree	2	11.8
	2-year college degree (Associate degree)	3	17.6
	4- year college degree (Bachelor's)	6	35.2
	Master's degree	2	11.8
Personal income			
	\$9,999 or less	5	29.4
	\$10,000 to \$29,999	2	11.8
	\$30,000 to \$49,999	5	29.4
	\$50,000 to \$69,999	4	23.5
	\$70,000 to \$89,999	1	5.9
Insurance			
	Public (Medicare/Medicaid)	7	41.2
	Private	10	58.8
Citizenship status			

	Non-citizen	1	5.9
	Citizen	16	94.1

Table 2. Participant Characteristics

Participant characteristics

Participant ID	Age	Sex	Ethnicity	Depression Screening Score/Severity	Anxiety Screening Score/Severity
Elicitation/key informant interviews					
EP02	32	Female	Afro-Caribbean	12; Moderate	12; Moderate
EP03	43	Female	Afro-Caribbean	18; Moderately severe	15; Severe
EP04	23	Male	Afro-Caribbean	22; Severe	18; Severe
EP07	37	Male	Afro-Latina/o	11; Moderate	15; Severe
EP08	22	Female	African-American	11; Moderate	7; Mild
EP10	42	Female	Afro-Latina/o	18; Moderately severe	14; Moderate
EP12	42	Female	African-American	15; Moderately severe	19; Severe
EP14	26	Male	African-American	15; Moderately severe	7; Mild
EP24	24	Female	African-American	12; Moderate	14; Moderate
EP33	28	Female	African-American	14; Moderate	6; Mild
EP35	23	Other	African-American	9; Mild	10; Moderate
EP38	28	Female	African immigrant	14; Moderate	9; Mild
Lab testing					
EP20	23	Female	African-American	14; Moderate	10; Moderate
EP26	26	Male	African-American	21; Severe	19; Severe
EP27	25	Female	African immigrant	10; Moderate	11; Moderate
EP31	33	Female	Afro-Caribbean	11; Moderate	9; Mild
EP32	44	Female	Afro-Caribbean	15; Moderately severe	19; Severe

Figure 1. Mobile app display options on prototype

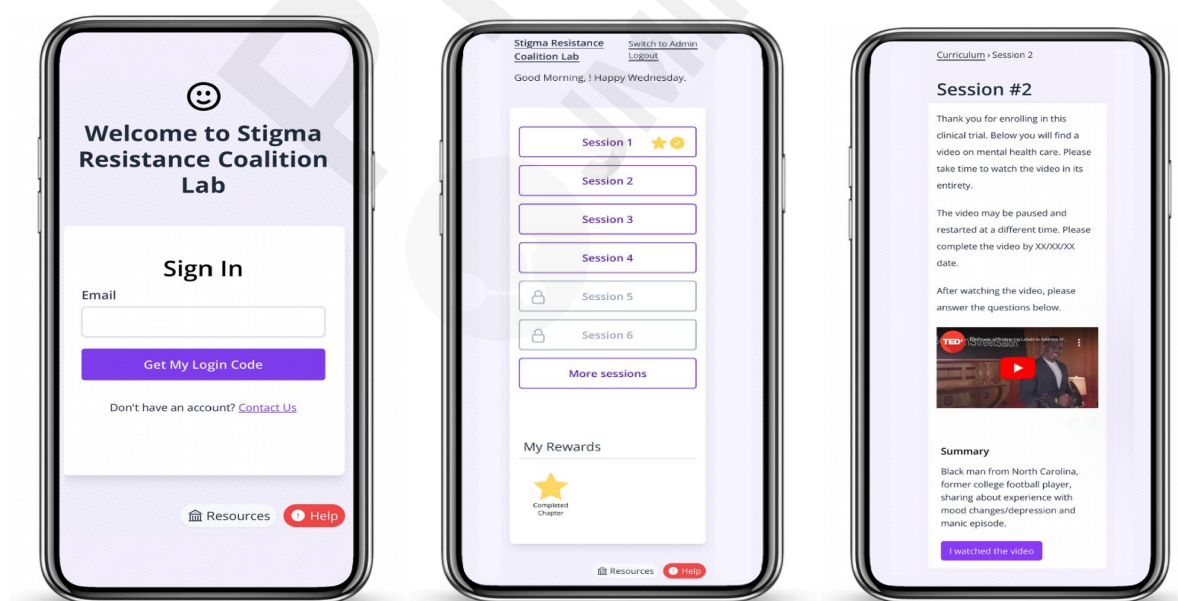


Table 3. Key informant interview questions

Key informant interview sample questions	
1)	How would you define: a) depression and b) anxiety?
2)	What is the likelihood of using your smartphone: a) for health information and b) for <u>mental</u> health information?
	a. What apps have you used in the past for your health (including behavioral health)?
	b. How do you prefer the information to be delivered (video, text, audio)?
	c. How often do you use these applications? And are these applications part of your lifestyle/routine?
3)	Have you heard direct firsthand life experiences or stories of people with depression or anxiety sharing about their illness, treatment and recovery? If so, in what contexts?
4)	If we created a video-based mobile application in which you could hear stories of people with mental illness share their firsthand lived experiences, how helpful would you find this?
5)	What would make you trust the mobile application (or smartphone app) more? Would you prefer someone of your same religious, ethnic/racial, or gender background to share their story?
6)	What features (such as internet required link, link that can be downloaded and watched later, full video completed in one session, ability to pause and restart video, videos broken up into different sessions for each week, number of steps to enter into video library, web-based vs. downloaded stand alone app, etc.) would be helpful to you in a video-based mobile application?
	a. What would it take for you to use this video based mobile application?
	b. When would you use this tool or video based program?
	c. How would you use this tool or video based program?
	d. What would prevent you from using this tool or video based program?
	e. Is there a time span that you think is ideal for each session with one session completed each week over 4 weeks? 1-2 minutes, 3-4 minutes, 4-6 minutes, 6-12 minutes?
	f. How might a short or longer video impact the use, or usefulness of the narrative?

Our analysis of the data revealed five major themes in elicitation interviews and lab design workshops: 1) optimal mobile application preferences for technical and service features; 2) use of narrative storytelling from a firsthand concordant perspective and the psychological effect of storytelling; 3) integration of storytelling into a mobile app platform; 4) the role of mental illness stigma; and 5) experience of mood related symptoms, and use of mental health systems. Field testing exit interviews were brief focused on final refining of completed prototype.

Elicitation Interviews

Table 4. *Key themes and subthemes with representative quotes from elicitation interviews*

Themes	Sub-Themes	Representative Quotes
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Theme 1: Optimal mobile application features: Technical and service preferences*Technical features*

	Comfort and familiarity with mobile applications	<i>"When I am in a sort of depressed or anxious state... I'll, maybe, go to YouTube and listen to positive affirmations, or I might just listen to meditation music to kind of calm me down and get me into a better state, help me to sleep - things like that." (EP_12, session 1)</i>
	<i>Technology accessibility and interactive features of mobile applications and tools</i>	<i>"Success rate and cost. If it's free and geared towards, me and my situation, I'm all for it. Also good ratings is, like, "Oh, yeah, like, 100 people used it in the past couple months, and they all loved it," or, "Ninety-five of them loved it." (EP_14, session 1)</i>
	Log on features and ease of access	<i>"I think, too many layers would be kinda cumbersome, and be a deterrent... I'm not gonna jump through those hoops because I'm not tech savvy." (EP_12, session 1)</i>
	Video access to mobile platform with or without internet connectivity	<i>"I think other things, you know, in terms of, like, when I'm, you know, online or whatever the case may be, the volume is a thing, but you can always control that. You know, 'cause sometimes you don't want people to hear what you're, you know, listening to or watching." (EP_7, session 1)</i>
	Audio and visual components	<i>"I think we're very kinesthetic learners, so I think video and audio work better for retaining information, especially if it's important for the person." (EP_14, session 1)</i>

Service Features

	Length and engagement level of video narratives	<i>"Two minutes like too short. I feel like maybe you don't feel like it's enough for me, maybe 12 minutes more better because you—maybe you find more information" (EP_10, session 1)</i>
	Timing of video delivery and segmentation	<i>"I think that, if it's locking up, [an] episode, the person would have the anxiety to achieve the next video... And, therefore, it's giving that kind of a chance, for that person, you know, to be so depressed. Because he has that anxiety to listen to the next video or to the next audio." (EP_4, session 1)</i>
	Timing of use and seamless integration into daily routine	<i>"I mean an app might be excellent for me. But someone might need something else....They might need, in person therapy, or, they might just do better, you know, one-on-one. But I just think that, for me and my lifestyle and everything that I have going on, something like this [an app] would be awesome." (EP_12, session 1)</i>
	Barriers to use of mobile applications	<i>"I think time is just a big thing. But I think one thing that makes things like this attractive is the fact that they don't take up a ton of time. Like, it's not like we're watching a 40-minute session or like a lecture." (EP_8, session 1)</i>

Theme 2. Narrative storytelling from firsthand perspectives**Concordance across socio-demographic factors (gender, race/ethnicity, religion)**

	Concordance in gender	<i>"Like, "Let it out. Something balling up." You know, but it's just—oh, my God. Like seein' that-I haven't seen a video like that-like I haven't seen a video with a Black man—well, I have a few on Instagram, but an app that has something like that is life changing." (EP_03, session 2)</i>
	Concordance in race/ethnicity	<i>"I like the intro. I don't know who she is, but I appreciated her talking about her being an actress and how, I appreciate her being active. The bravery of saying that she was dealing with suicidal ideation that she has dealt with suicidal ideation. I feel like I've seen a lot of white people in these videos, so I appreciated that it was a woman of color. I thought it was a good—it was a good intro into whatever she was going to say. Like, it helped." (EP_07, session 2)</i>

	Other sociodemographic perspective	<i>"Yeah. This video also reminded me that I think people—I'm making a lot of generalizations, but I think that people are also more receptive to people who are in their age group, like, seeing someone who's also, like, in the college age, uh, thing—it puts in context things or experiences that you also may have like, uh, what are potential triggers that someone in-in the college age, would it be experiencing whether that be school, you know, transitioning out of college, that type of thing. So I think that was also something to consider like age group." (EP_08, session 2)</i>
General experience of listening to firsthand narratives on mental health		
	Experience of hearing stories in the past	<i>"My significant other, um, told me about how her mom, um, she was bipolar and manic, and she basically had electroshock therapy. And after the treatment, she completely changed. Her personality was basically a new person and how they had to kind of cope with that over several years." (EP_14, session 1)</i>
	Current experience of hearing stories during interview	<i>"The third video with the guy talking about kind of like all our generational baggage, that stuck out to me 'cause he's like, you know—and the guy—well, I guess—no. As I'm saying that the guy from the third video, who was like, "Sometimes depression comes off as anger. And, you know, realizing that some of the guys that just wake up ready to fuck people up is 'cause they're angry." That stuck out to me." (EP_07, session 2)</i>
	Psychological impact/emotional effect	<i>"Sorry. I started tearin' up. Yeah. Her story resonated with me. To see someone my color, um, looks like me, yeah, it hit me in the gut 'cause sometime we tend to do a lot of spiritual bypassin'." (EP_03, session 2)</i>

Theme 3. Integration of storytelling into mobile app platform

Integration of stories into app		
	Use of stories in mobile app and psychological benefit of listening to stories	<i>"That would be super helpful because you hear someone actually give their live kind of recount of what they've gone through, what they're going through, it can really—you know, that human ability to empathize with someone is very powerful and leaves a very long-lasting impression." (EP_14, session 1)</i>
	Other aspects of storytelling	<i>"I would feel more inclined to speak to a stranger or to trust a stranger, than I would people my own family, probably, and social circles, just because they are so comfortable with, you know, just the hiding, or they're not ready—you know, they're just not in that space. I can't have a conversation and feel supported with folks like that. I would rather speak to a stranger or rather read on an app or something outside of my own family, for the support that I need." (EP_12, session 1)</i>

Theme 4. Mental illness stigma

Experienced, anticipated, and internalized stigma across demographic contexts		
	Religious based stigma	<i>"I can connect with her because I feel like, I come from a very religious family. And I related to her with the sense that people would judge and just say that you need to just pray away the mental illness and that what's going to help. But it's also, you know, with therapy, and, you know, even if you need to take medication as well and prayer for, you know. I related to that a lot." (EP_02, session 2)</i>
	Community based perspectives and public stigma	<i>"my cousin diagnosed schizophrenic and, bipolar. And so, when he started displaying these traits just—you know, that didn't kind of make sense, it was just ignored until, it got to the point of him getting put out of</i>

		<i>school. And, you know, then, he had to be hospitalized.... It's just kind of shameful in my opinion, that we don't do a better job of, maybe [addressing it], because we don't have the tools.” (EP_12, session 1)</i>
	Self and internalized stigma	<i>“Yeah. I was just thinking’ about we’re not the labels that society bestow upon us, if they label us—you go to a psychiatrist, they’ll label me with mild depression. I’m not that mild depression. Right? I’m more than that. I’m a human being, and there’s no limits to my success.... That I’m a capable person, right, of working, of having healthy relationships with my family and asking for help when I need to because sometimes, you know, we’re afraid, like he said. Fear of other people knowing that we do suffer from this, and fear of judgment is real also. I’ve been really open about my mental health because I have no shame about it.” (EP_03, session 2)</i>
Theme 5. Experience of mood related symptoms and use of mental health care systems		
Understanding of mood related symptoms		
	General understanding experience of mood symptoms (depression, anxiety and other mood disorders)	<i>“I would define depression as a constant state of... it doesn’t have to be sadness, but it more so manifests like difficulty doing things. Like regular tasks. Like brushing your teeth becomes hard, showering becomes hard. Staying connected to loved ones becomes hard. Just completing any task seems like a mountain, even if they’re just like a simple thing. I would define [anxiety] as a constant state of fear, it can look like ruminating over things, anticipating the worst.” (EP_8, session 1)</i>
	Specific mood symptoms observed in others	<i>“I have a friendship from Columbia [country]. She told me, “Oh! I feel like jumping sometimes. I want to jump off the bridge.” I said like, “No. Don’t do that.” Do something else. You have to go, you know, to depression meetings like a safe area, maybe you feel a little better.” But I thinking’ about her drop-dropping like the bridge. I feel like scared a little bit because she want to kill herself.... And it helped a little bit. Now she does a little something like me, volunteer in a community.” (EP_10, session 1)</i>
	Self-observed symptoms (depression, anxiety and somatic symptoms)	<i>“Anxiety..., for me, it shows up as palpitations or, like I said, restlessness, inability to concentrate and focus on kind of just one thing. I’m just in a state of worry. And it’s just very difficult for me, to settle down, I think. It also manifests for me, in high blood pressure and, like, health conditions... early-stage heart disease.” (EP_12, session 1)</i>
Use of health care systems		
	Use of mental health care (mindfulness, therapy, medications and ECT) and barriers to accessing treatment	<i>“A lot of people are able to identify their symptoms or their experiences or their feelings, but a lot of people don’t know where to start, well, like, with regards to seeking help. I think if people were expanding a little bit more like, “Oh, I realized that I really did need the help. This is where I started to start seeking those resources.” I think that’ll be really important.” (EP_08, session 2)</i>

Theme 1. Optimal mobile application features: Technical and service preferences

1.1 Technical features

1.1a. Comfort and familiarity with mobile applications

All participants noted using their mobile devices as a health support resource or for health

information. The majority of participants described the use of specific mobile health applications, including mindfulness apps, health service apps, and exercise or fitness tracker apps. There was high acceptability of the use of mobile devices as a health resource and the use of mobile apps. Most participants noted high comfortability with the use of mobile

1.1b. Technology accessibility and interactive features of mobile applications and tools

Participants highlighted the importance of interactivity in apps, emphasizing features like reminders, personalized content, and engagement components to maintain user engagement. Participants valued clear past success rates, positive user reviewers, and affordability, which they indicated enhanced the app's credibility and appeal. Personalized and interactive elements were seen as critical for helping users with sustained, consistent use despite busy schedules and competing obligations.

1.1c. Log on features and ease of access

Participants expressed the importance of simplicity (e.g. username and password set up) and accessibility in navigating the app. Some participants considered three to four steps acceptable for accessing the content, while others preferred one to two steps. Emphasis was placed on easy access, with an average of two to three steps.

1.1d. Video access to mobile platform with or without internet connectivity

Participants expressed preferences for flexibility and convenience in video access mechanisms, highlighting the value of versions that can be downloaded and versions that require internet connections. Additionally, participants mentioned privacy considerations, such as controlling volume levels to prevent others from overhearing content and using app names that are not related to mental health.

1.1e. Audio and visual components

Participants preferred various modes of information delivery, citing pros and cons of audio and

visual formats. Audio options, such as podcasts, were highly valued for their convenience, enabling users to engage while multitasking. Visual aids in video formats were considered as critical for sustaining attention and improving understanding, with participants appreciating short videos that were engaging. Participants preferred approaches that integrated both audio and visual displays, used legible fonts, and afforded some flexibility in choosing the delivery format.

1.2	Service	Features
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1.2a. Length and engagement level of video narratives

Participants noted the range of time for narrative video sessions; the majority of participants preferred shorter videos with a range of 4 – 15 minutes and optimal length between 4-6 minutes. Participants noted how more interactive components would allow for longer videos (up to 15 minutes) that maintain attention. One participant noted the younger generation (18-24) preferred quick 12 second clips. Still, it stated mental health information may require being able to sit and listen for longer periods in order to consolidate knowledge.

1.2b. Timing of video delivery and segmentation

Participants emphasized the importance of flexibility in timing of when the app was sent to them (or when they received prompts) and preferred systems that accommodate their varied schedules and preferences. Participants valued the idea of having video content segmented into multiple parts, likening it to episodic formats that create anticipation and excitement for upcoming installments. Furthermore, participants highlighted the need for control features like pause, restart, and resume, enabling them to engage with content at their convenience. One participant noted that giving users flexibility of choice in choosing activities or videos would reduce anticipatory anxiety that may arise from having segments or episodes locked.

1.2c. Timing of use and seamless integration into daily routine

Participants highlighted how app usage can align with their daily routines to maximize accessibility

and impact. Participants also expressed their preference for incorporating the app into specific times of the day, such as mornings or evenings, to help navigate stress or prepare for or wind down from their day. Additionally, participants expressed the importance of integrating the app into their daily lives during stressful situations or transitional periods, using it as a tool for self-awareness and emotional regulation.

1.2d. Barriers to use of mobile applications

One key barrier to app usage was the availability of time. Another concern noted by a participant was that digital tools may not be objective, or the story/narrative offered on a digital platform may be biased. Another participant noted the importance of software accessibility on different versions of mobile phones. One participant noted the value of user privacy while using the app.

Theme 2. Narrative storytelling from firsthand perspectives

2.1. Concordance across socio-demographic factors (gender, race/ethnicity, religion)

2.1a Concordance in gender

Participants highlighted the significance of shared identity in gender, with some male participants noting the benefit of hearing from Black males and likewise female participants noting the importance of hearing from Black females. Male participants also noted the value of seeing their gender represented in the narrative format challenged the status quo around mental health among Black men. One participant noted that gender did not matter to them, though majority of the respondents felt shared gender identity was valuable.

2.1b Concordance in race/ethnicity

Participants valued racial and ethnic concordance, stating seeing people of similar backgrounds fostered relatability, trust, and engagement. Participants highlighted how race and shared lived experiences shaped their receptivity to messages and their perception of the narrator's authenticity.

2.1c Other sociodemographic perspective

Participants highlighted the importance of sociodemographic alignment in mental health narratives. Participants expressed a stronger connection to stories featuring individuals who resembled their age group and socioeconomic background, or shared similar personal experiences, such as navigating challenges independently.

2.2 General experience of listening to firsthand narratives on mental health

2.2a Experience of hearing stories in the past

Participants reflected on their past experiences of hearing stories, in some cases participants noted very limited exposure to personal narratives. The majority of participants did not have a source of structured positive narratives, and noted more general stories from friends or family members. One participant noted the value of podcasts where hosts discuss personal coping tools, providing relatable and practical insights into how to manage mental health symptoms. Another participant highlighted narratives, mostly abusive and coercive in nature, surrounding historical and cultural perceptions of asylums.

2.2b Current experience of hearing stories during interview

Participants reflected on their experiences of hearing stories during the interview, emphasizing the relatability and depth of the narratives. They appreciated stories that explored how past experiences shaped current realities, providing insights into the root of mental health struggles.

2.2c Psychological impact/emotional effect

Participants expressed a range of emotional responses, including noting intense, sometimes uncomfortable feelings, and the psychological impact after hearing the stories shared in the interviews. Participants found the narratives relatable, resonating with their own experiences and struggles, particularly when the stories addressed mental health challenges, tensions with religion, and specific experiences of overcoming adversity. Another emphasized the importance of

addressing historical mistrust within communities, and the value of stories from trusted elders, especially among Black individuals.

Theme 3. Integration of storytelling into mobile app platform

3.1 Integration of stories into app

3.1a Use of stories in mobile apps and the psychological benefit of listening to stories

Participants provided extensive feedback on how to integrate mental health stories into a mobile app, emphasizing the importance of storytelling formats, visuals, and relatability. Two participants described how their co-morbid mental health symptoms (i.e., ADHD) may affect how they engage with stories on a digital platform. They noted the importance of formats and displays that make the story more engaging without being distracting in visuals, for example pictures of the individual relating their narratives in their real life with family members, rather than unrelated photos.

3.1b Other aspects of storytelling

Participants shared their perspectives on the effectiveness of storytelling formats (e.g., podcasts, [and maybe 2 more examples]), emphasizing the importance of relatability, effective communication and personal connection. Some participants noted some preference for a podcast format and others preferred a TEDtalk format. Most respondents did not want a monologue without any interactive element.

Theme 4. Mental illness stigma

4.1 Experienced, anticipated, and internalized stigma across demographic contexts

4.1a Religious based stigma

Participants highlighted the impact of stigma related to religious beliefs on mental health, particularly within communities where prayer or faith may be seen as the sole solution to mental illness. Participants emphasized the value of the co-existence of various sources of help such as religion, support from the religious community, and the use of professional mental health services.

4.1b Community based perspectives and Public Stigma

Participants highlighted perspectives on public stigma, including fears of employers finding out one has a mental illness and the associated negative repercussions. Many acknowledged the persistent public stigma surrounding mental illness, with particular challenges faced by Black men. Additionally, participants noted that dismissing mental health struggles as a weakness or promoting the notion of “get over it,” contributes to a reluctance to seek help.

4.1c Self and internalized stigma

Participants note personal experiences of stigma, feelings of isolation and loneliness navigating societal systems and structures, where they often lack peers who can empathize with or understand their unique challenges.

Theme 5. Experience of mood-related symptoms and use of mental health care systems.

5.1 Understanding of mood related symptoms

5.1a General understanding experience of mood symptoms (depression, anxiety and other mood disorders)

Participants provided their conceptualization and understanding of the general symptoms of depression and anxiety. They also noted the importance of awareness and self-reflection about symptoms. Additionally, participants noted the unique mental health challenges related to racial trauma.

5.1b Specific mood symptoms observed in others

Participants shared direct observations of specific symptoms of mental illness in others, such as suicidal thoughts or behavior. Overall, their reflections highlighted the complexity and challenges of addressing these symptoms.

5.1c Self-observed symptoms (depression, anxiety and somatic symptoms)

Participants shared firsthand accounts of their experiences with depression, anxiety, and somatic symptoms, noting how symptoms may present in their daily experiences. Some participants reported feeling psychosomatic symptoms such as heart palpitations.

5.2 Use of health care systems

5.2a Use of mental health services (mindfulness, therapy, medications and ECT)

Participants noted the need for various mental health care options, including psychotherapy, and pharmacology. Several participants linked the prevalence of physical conditions like heart disease and hypertension in Black people to unaddressed stress and anxiety; some participants highlighted the value of personalized care, discussing when medication might be needed. Participants highlighted barriers such as financial constraints. Participants noted the need for culturally informed interventions.

Lab based design workshops (qualitative interviews)

For the lab-based design workshops, using a working prototype, participants provided feedback around three themes that were consistent with the elicitation interview themes. Themes included technical and service features of the mobile application, and integration of narrative storytelling within the app platform. These design workshops were focused on iteratively refining the design aspects of the prototype.

Theme 1. Lab based workshops on optimal mobile application features: Technical preferences

Participants noted the distinction between a web based and stand-alone app. Several participants reported the importance of privacy features and concerns about the app connecting to other platforms like google or facebook. However, one participant noted the usefulness of quick sign on

by connecting to google or apple log in data. Participants recommended features that personalized the layout, such as greetings with names, easy to read layouts and an app layout matching time of day or displaying a sunset congruent with one's geographic location.

"I would probably say ... in a website [format] as opposed to an app [format].... when I think of an app, it's something that I want to reuse on a reoccurring basis as opposed to just if I go through all the videos and do all the assessments, now what? Like, what is the purpose of this app?" (EP20).

"I think colors are good for your, like, brain to compartmentalize different things and categories....It has something coded into the app to read your time zone and know when it's night and daytime and at a certain time period it will change to be sunset or such. And ...it immerses you more and makes you want to interact with it more, so I think that's really a brilliant idea to have" (EP26)

"You don't want anybody to—I mean, if anybody was to have your phone, they were curious to log onto—to click onto the app, you don't want anybody just getting onto your personal business very easily. (EP31)

"It can be missed. It's very fine print. Maybe a little bit more pronounced, more noticeable" (EP32)

Theme 2. Lab based workshops on optimal mobile application features: Service preferences

Participants described the specific services they would like displayed on the mobile app. They noted having space for a written open response may be overwhelming and instead multiple choice format would be more acceptable. Participants also noted the benefit of inviting visuals. Participants provided feedback on the need for an easy to use layout for signing up for more information about

accessing mental health services. Participants preferred more subtle recommendations to seek mental health services, rather than being asked at the beginning of one's engagement with the app.

"Probably just keep the multiple choice 'cause if you have more, like, a written open response, it might turn people off, 'cause then it's like, oh, now I have to write something about this" (EP20).

"I just thought it would have this—something asking if you feel suicidal or something, and have a hyperlink or something, or a button that takes you to the National Suicide Hotline" (EP26).

"Honestly. Um, I think it-it varies for me personally. I would just wait until the last session to probably want to see this, and then, I have the option of signing up, and then, whoever is working behind this could follow up with me with the resources that they can provide" (EP31).

"So putting it at the end just kind of reiterates that you have the option to make the appointment. So having it available as an option is nice. And then there's times that, you know, there's times that I just, like, I just want to tap in because I'm working on myself. And I just want to make an appointment with myself (EP32).

Theme 3. Lab based workshops on integration of storytelling into mobile app platform

Participants shared on ways to integrate the videos and stories within the app platform that would enhance engagement of users. Participants described the benefits of seeing topical descriptions of the stories, frequency of new videos on the app, practicality of incorporating the videos within daily routines and knowing the length of videos before watching them.

“I think—I don't know, maybe not daily routine, but I think like a couple times a week watching videos like these, watching videos like these throughout the week would help a bit more, again, with relatability and feeling less alone. In terms of usage I would say I would probably use it if I was feeling especially low” (EP27).

“I mean, like I said, if you give a description of why, like—how do I say this—you want people to watch the video. Like, what is the purpose of them watching the video given that—then give a description of what the video may be and then, follow it with the questions of what they probably have learnt with watching the video (EP31).

Field testing exit interviews

Field testing interviews focused on overall user experience in a brief exit interview. The main themes included overall impression on user experience engaging with the app in a real-world setting, challenges with integrating the app prototype into one's daily routines and specific feedback on the video content of the app.

“Once I got logged in and was able to find where the videos are ... I liked the way it's set up. It wasn't like, “Oh ... where this is, or, like, how to get to a specific thing.” I just did it.” (EP35).

“I would describe my overall experience, like, if I had to rate it from, like, a 0 to 10, like, 10 being the absolute worst and—excuse me—0 being the absolute worst and 10 being the absolute best, um, I'd give it, like, a 7. Um, I felt like it was very simple, um, like, with me knowing, in the back of my head, this is like a prototype, sort of app. Um, it was very simple to access. It was very simple to navigate through it” (EP24).

“So my experience, I really like the videos. I feel like I could relate to some of the videos. I think the only thing I didn't like was, like, after, it kept asking for a code... but other than that, I really love the app, the videos, and the questions they asked.” (EP33).

Discussion

Using UCD methods with end users, we identified critical components for the design and development of a culturally informed video-based mobile mental health stigma reducing app prototype for Black adults with moderate to severe depression or anxiety. Participants placed significant emphasis on the crucial value of optimizing technical and service features; and concordance across socio-demographic characteristics. In particular, they expressed the importance of race/ethnicity, gender, generational status and religion in fostering acceptability and engagement with the intervention. Participants highlighted challenges in identifying and seeking mental health services related to stigma. These findings extend the current literature on mobile mental health apps,^{18,43} by deepening our knowledge on topics related to the salience of shared identity and concordance^{33,44,45} in health care among Black adults. Our findings emphasize the specific value of sharing characteristics with persons presenting narratives on a video-based digital platform. Participants also noted the lack of mental health resources that were tailored to their specific preferences and needs⁴⁶⁻⁴⁸.

While racial concordance is well established as beneficial in areas such as physician-patient concordance, the area of concordance in narrative storytelling in mental health is grossly understudied. Among the limited number of studies, Amsalem et al used brief videos of people sharing their personal experiences with schizophrenia and measured stigma-related outcomes, but their study had limited assessment of the role of socio-demographic concordance and of longer-term post-intervention outcomes^{44,49-51}. This rigorous body of work highlights the need for increased tailoring around cultural or shared identity factors that could affect intervention implementation, acceptance and/or outcomes. Our study builds on this body of work and extends it by emphasizing that a digital platform can incorporate further concordance on additional sociodemographic factors such as generational status, religiosity, and educational attainment. Throughout our study, participants noted the positive value of sharing not only obvious but also subtle characteristics with narrators (e.g., identifying with a narrator who was also a college athlete). Thus, we provide further

and more robust evidence for the salience of concordance in race and other socio-demographic factors.

Concordance in race and ethnicity was the form of concordance most prominently noted by participants. Other sociodemographic factors also mentioned include concordance in gender, religion, educational background, and past lived experiences. The health effects of racial concordance have been studied extensively in the area of physician-patient concordance^{15,33,52,53}, but there has been very limited research on the role of racial concordance in narrative storytelling—and little to no research at all on the role of racial concordance in narrative storytelling on a mobile mental health platform. Our study extends the literature by noting the reported and observed real time psychological impact on participants of hearing stories from people of similar racial/ethnic and gender backgrounds. This impact was palpable during elicitation interviews and lab testing, with some participants becoming visibly emotional, at times tearful, when listening to the stories. Despite the noted positive value of concordance, one participant noted that over-identification with a story could also cause psychological discomfort. Hence, there may be a need to incorporate real time support sources within the mobile app video library platform (e.g., 988 hotline) given the evoked emotions of listening to firsthand narratives. Another alternative is including user autonomy in choosing from several different stories in a video library format with speakers from many different racial/ethnic and gender backgrounds.

Participants in our study found the mobile app prototype to be acceptable, citing their past use of mobile devices for both general health needs and mental health care. While disparities in smartphone access persist in the U.S., they have narrowed significantly, with up to 87% of Black adults having smartphone access, compared to 91% of white adults and 97% of Asian adults¹⁸. However, the specific use of firsthand storytelling within a mobile app platform for mental health needs was novel in this group of end-users. Participants were favorably disposed toward accessing stories through YouTube or through other online venues but specifically stated that, as Black people, they rarely saw videos tailored to their lived experiences or other personalized features. The Internet can be difficult to navigate for people seeking health information and even more so for people

seeking evidence-based psychoeducational content. Thus, this app provides a tested, reliable, useful and evidence-based platform to which clinicians can direct patients who are not in routine care and who might be interested in hearing firsthand experiences from peers.

Participants also noted a strong preference for apps to be interactive, visually appealing, easy to use, and personalized. Their willingness to engage with a specific app would depend on credibility of the app creator, success rates of the app in improving knowledge, positive reviewer feedback of the app by other users, and affordability. The cost of health care apps tends to make them less accessible⁵⁴. While some of these factors on engagement are somewhat universal, specific aspects for this population included the need to feel safe (app credibility), to enhance trust in the application and content (acceptable within community context), and to make the app relatable and relevant to one's cultural context and background.

Shorter videos (e.g., 2-6 minutes in length) have been shown to be more appealing in terms of marketability and engagement for learning consolidation^{55,56}, but in the health care space, the length of videos for narrative storytelling is not well studied. The optimal length and content of videos should consider the intent and purpose of the videos. The participants noted that video-based narrative storytelling on mental health should strike a balance between avoiding ultra-short videos (i.e., less than 2 minutes) in which they felt they could not fully engage in the narrative story and unnecessarily long videos (i.e., >30 minutes) in which engagement is compromised. Participants emphasized the need to hear a complete story (citing an optimal average length of 5-7 minutes) that would allow for lessons to be learned, for them to gain insights about the mental health process, and for them to learn about practical skills or tools that could be incorporated into their own mental health or wellness journeys.

Study Limitations

Interpretation of our findings is subject to several limitations. First, women were overrepresented in our sample. Additional perspectives from Black men eliciting their unique needs and experiences would be important for this population. While we note a predominance of female participants in the study, there is a higher prevalence of depression among women compared to

men in the general population⁵⁷. Second, we used videos from the National Alliance on Mental Illness and from other online sources. The creation of new content that specifically addressed one's experience through the onset of symptoms, diagnosis, treatment and recovery could have improved the quality and content of the video narratives.

Conclusion

In this qualitative study of Black men and women with moderate to severe anxiety and/or depression, most voiced appreciation for a mobile mental health app that curated firsthand narratives to promote understanding of mental health care. The app offered a contact based learning platform for reducing mental illness stigma and improving mental health treatment engagement. Given the stigma of mental illness, study participants appreciated the anonymity of the mobile app. They acknowledged their own personal experience of mood related symptoms and voiced how the videos improved their understanding of their symptoms and expanded their awareness of steps towards receiving mental health services. Thus, the app prototype offered a novel resource to participants who, despite meeting screening criteria for moderate to severe depression or anxiety, were not receiving any routine mental health services. Future research should test its potential for routine use by patients with mental illness symptoms who are not ready to engage in routine mental health care.

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