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Featured Article

Assessing acceptability and patient experience of a behavioral lifestyle intervention using fitbit technology in older adults to manage type 2 diabetes amid COVID-19 pandemic: A focus group study

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ABSTRACT

Type 2 diabetes (T2D) contributes to reduced quality of life in older adults, especially in those with comorbidities such as being overweight or obese. Personal fitness technology (Fitbit ®) has the potential to improve the management of T2D. Using a semi-structured interview guide, focus groups were conducted to explore participants' acceptability and experiences following a behavioral lifestyle intervention that integrated Fitbit in overweight/obese older adults with T2D amid the COVID-19 pandemic which began during the time of this study. Focus group transcripts were transcribed and analyzed using thematic analysis. Eighteen (18) of the 20 participants completed the program and focus group interviews. Overall, we observed high acceptability of the program, and participants reported favorable experiences such as increased knowledge of health behaviors, improved diabetes management, and improved quality of life following the behavioral lifestyle intervention, even under stressful life circumstances from COVID-19.

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Introduction

Type 2 Diabetes (T2D) is one of the most significant and growing health concerns for older adults (aged 65 years and older) in the United States. More than 1 in 4 U.S. adults (26.6%) aged 65 years or older have diabetes.[1] The estimated total economic cost of diagnosed diabetes in 2017 was $327 billion, which is a 26% increase from a previous estimate in 2012. The cost of diabetes also primarily lies among the older population,[2] a higher proportion of which are also overweight (25%) or obese (43%) relative to younger populations.[1,3] In addition to microvascular and macrovascular complications, older adults with diabetes are at increased risk of falls, hospitalization, depression, disability, frailty, and death.[4]

For individuals diagnosed with T2D and having other comorbid conditions such as being overweight or obese, effective health management is crucial to mitigate the risk of complications and to reduce the personal and economic burden of the disease. Management of diabetes is complex, especially for older adults. Older adults make many choices related to their comorbidities, such as self-managing and self-monitoring of multiple behaviors (e.g., diet and activity) in addition to navigating polypharmacy-related treatment of T2D, which may lead to adverse drug events. Self-management is a functional component of diabetes management and has been shown to have a significant impact on patients' behaviors, such as eating a healthier diet, increasing physical activity, adhering to medication, and monitoring glucose.[5–9] Behavioral lifestyle interventions for diabetes, including self-monitoring, are also associated with improved glycemic control and reduced risk of all-cause mortality.[10,11] The Look AHEAD (Action for Health in Diabetes) study is a longitudinal, multi-center, randomized clinical trial tested a behavioral lifestyle intervention of weight loss and physical activity in overweight/obese adults with T2D. The two principal intervention goals were to induce a mean loss ≥ of 7% of initial weight and to increase participants' physical activity to ≥ 175 minutes a week. The trial demonstrated the efficacy of the intervention for improved physical function, reduced adiposity, and improved glycemic control.[12]

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However, the effectiveness of behavioral lifestyle programs in community-dwelling overweight/obese older adults with T2D is inconclusive or uncertain.[13–15]

The behavioral lifestyle intervention program used in the Look AHEAD trial was based on self-monitoring. The integration of self-monitoring for behavior management is especially important among patients with multiple chronic conditions since clinical performance measures do not provide a complete picture of health and illness.[16] Technological devices may enhance patients' ability to self-monitor behavior. Since 70% of Baby Boomers (ages 55 to 73) and 40% of the Silent Generation (74 to 91) own smartphones,[17] we expected that older adults may be interested in incorporating smart devices into their health care. Among older adults with smartphones, seeking health information was the second most frequently executed task behind making phone calls.[17] Mobile Health (mHealth) technologies are being rapidly adopted, while smartphones and wearable devices increasingly enable sophisticated health monitoring and facilitate communication with healthcare providers.[18] It is documented that mHealth technologies can aid in treatment, adherence, and management of chronic conditions (e.g., diabetes, heart disease, cancer, and asthma) and improve self-awareness, self-efficacy, readiness, and adherence in modifying behavior to improve both patient and provider satisfaction.[19–21]

This study began with a modified Look AHEAD behavioral lifestyle intervention. This modified behavioral lifestyle intervention lasted 6 months and integrated a mHealth device. After completion, participants took part in focus group interviews about their experiences at the end of the 6-month intervention. The aim of the interviews was to assess acceptability and patient experiences of the behavioral lifestyle intervention (i.e., diet and physical activity) utilizing personal fitness technology (Fitbit ®) in community-dwelling overweight/obese older adults with T2D. The COVID-19 pandemic occurred during the study, causing the adaptation of program materials and discussions for virtual delivery using WebEx. The pandemic may also have affected the participants' experiences and the ability to participate in the program. For this reason, we included a question about how the COVID-19 pandemic affected participants' behaviors (such as diet and activity). This change enabled us to examine the acceptability of the intervention for diabetes management under stressful circumstances, wherein we may expect acceptance to be lower due to the participation burden. The COVID-19 pandemic related stressors on participants adds to the ecological validity of our results and reflects added "real world" stressors that individuals encounter while participating in behavioral management programs.

Methods

Study design

Focus groups were conducted after a 6-month pilot study to examine the feasibility of the behavioral lifestyle intervention. Participants were divided into 4 groups depending on the time of entry into the study. Initially, all participants/groups were to receive a total of 10 face-to-face group educational sessions to supplement the smartphone-based self-monitoring of their diet and physical activity. However, due to COVID-19 restrictions, groups 2, 3, and 4 attended some group educational sessions and their focus group session virtually via WebEx to complete the study.

Setting and participants

A total of 20 community-dwelling overweight/obese older adults (65 and older) with T2D from San Antonio, Texas were recruited. Participants were recruited by flyers and advertisements in local community areas and affiliated institutional channels. Eligibility criteria included: ages 65 years and older, self-reported T2D diagnosis, overweight/obese (BMI $\geq$ 25), owning a smartphone, and living in a community-dwelling. Participants were first screened over the phone to determine eligibility. If eligible, participants were invited to the University of Texas Health Science Center at San Antonio (UTHSCSA) to complete the baseline sessions. Participants received a $15 gift card for completing a baseline visit and again for completing the study. All 20 participants who came in for a baseline visit were eligible, consented to, and enrolled in the study. Consent was provided for both intervention and focus group procedures. After the first educational session, there were 2 dropouts, leaving 18 participants for their final visits and assessments. These same 18 participants then completed the focus group interviews and contributed to the transcripts analyzed for this study. This study was approved by the Institutional Review Board (HSC20190019H) at the UTHSCSA. Written consent was obtained before participation in the program and approval for audio-recording was obtained before all focus group interviews.

Data collection and procedure

At the end of behavioral lifestyle intervention session 10, focus group interviews were conducted with all participants. These interviews lasted 30–60 min in length. The study's primary investigator (PI) facilitated the focus group discussions using a semi-structured interview guide (Table 1). Each of the focus group interviews was transcribed verbatim by a research assistant or by using NVivo version 1.1 transcription software before being finalized by a research assistant. Following the intervention, focus groups were conducted via WebEx for groups 2, 3, and 4. Group 1 participated in an in-person focus group at their final study visit, before COVID-19 restrictions. Participants in groups 2 and 3 were combined for their WebEx focus group session given the lower number of participants in these groups.

Study intervention

The PI used a publicly available behavioral lifestyle intervention guide for the study sessions, from the Look AHEAD and Diabetes Prevention Program Group Lifestyle Balance. During all 10 sessions, the PI focused on adherence to behaviors using motivational strategies: self-monitoring, goal setting, feedback, mindful eating, talking back negative thoughts, social support, rewards, problem-solving, relapse prevention, and handling holidays. A Fitbit was provided to all study participants and the companion Fitbit app was downloaded on each person's phone with support from the research team. Participants received training on how to record their food and activity using the Fitbit application on their smartphones. Participants were also given a written "cheat sheet" of instructions, and instructions were reinforced throughout the study during group sessions. Participants were asked to wear their Fitbit at all times, except when recharging the device. Each participant was given a weight loss goal of 7% tailored to their baseline weight and physical activity goal which gradually

Table 1
Focus Group Interview Guide

1. Tell us how self-monitoring, with Fitbit device, diet and activity behaviors has impacted your health in general and your diabetes.
2. What did you like or dislike about it? How did it help change your behavior?
3. What behavioral strategies have been most helpful and were there any that did not work for you?
4. What are your plans for staying on track in the absence of these group sessions?
5. Tell us about what health or appearance benefits you have had since joining the program and their effect on your quality of life?
6. How has corona virus (social distancing, staying home) impacted your life in terms of the study findings (diet, activity, and diabetes management)?

increased to at least 175 min of activity per week, following the Look AHEAD guidelines.[12]

Analysis

Thematic analysis was used to code de-identified transcript data and to generate the resulting themes and codes.[22] Three research assistants who were trained to conduct qualitative coding read and re-read transcripts several times to familiarize themselves with the data. Then, they independently coded the first transcript using an open style of coding to highlight important phrases and/or sentences from the data. Like data were grouped and codes were assigned. After meeting to discuss independent coding results, a codebook was developed and then independently applied to the second transcript. Next, the team met to refine the codebook further, which was then applied a third time to independently code the remaining transcript data. After all the group interviews were coded, the research team met to reconcile coding discrepancies through discussion and to identify themes. A resulting 20 codes were generated and finalized from the coding team. These codes were then grouped into 15 sub-themes based on code similarities in material or topic. Then, sub-themes were grouped into 6 larger themes, reflecting overall participant experiences on various aspects of the behavioral lifestyle intervention, including COVID-19. If necessary, during this process, any queries or disagreements were brought to the PI to be settled. In the end, all themes and codes generated were reconciled and agreed upon by all members of the research team.

Results

Sample characteristics

A total of 20 participants were enrolled in this pilot study. There was a 90% retention rate (18/20 participants) at 6 months. Everyone who completed the pilot study also participated at the end of the study focus group discussions. The mean age was 72 (± 5.4) years old. Over half (56%) were female and 50% of participants were Hispanic (Table 2). There were 3 participants in group 1 (1 dropout), 4 participants in group 2, 4 participants in group 3, and 9 participants in group 4 (1 dropout).

Focus groups themes

Analysis of the focus group discussions on the participants' acceptability and experience of behavioral lifestyle intervention revealed six themes: 1*) The Impact of COVID-19 on Behavioral Interventions and Program Acceptability*; 2) *Participant Logistics of Adherence with the Goal of Diabetes Management*; 3) *Impact of Technology (Fitbit) on Behavioral Intervention*; 4) *Perceptions of Program Participation on Quality of Life*; 5) *Impact of Intervention and Future Plans*, and 6) *Challenges and/or Resistance During the Program* (Fig. 1). These results portray the firsthand journey through the perceived learning and behavior modifications, as well as the resulting general and specific improvement in diabetes management and quality of life noticed by participants. These results also include the pertinent impact of COVID-19 on older adults with comorbid conditions on factors related to behavior modifications, overall life, and socialization. Finally, these results demonstrate our participants' acceptability to the lifestyle changes encouraged by the program and how they responded to and integrated behavior changes into their lives.

Table 2
Baseline Demographic Characteristics (N=18)

Variables	Mean (SD)/N (%)	
Age	72 (5.4)	
Sex (female)	10 (56%)	
Ethnicity	(Hispanic or Latino)	9 (50%)
Marital Status	Married	8 (44.4%)
	Divorced	4 (22.2%)
	Widowed	4 (22.2%)
	Never Married	2 (11.1%)

1. The Impact of COVID-19 on Behavioral Interventions and Program Acceptability

The impact of COVID-19 was relevant only to groups 2, 3, and 4 due to the timing of the COVID-19 spread. Group 1 finished the study before the COVID-19 restrictions, and as such, COVID-19 related questions were not asked to them. In this theme, participants expressed the impact of COVID-19 related stresses while modifying their study-related behaviors as well as its effect on non-study related factors, such as participants' social lives. The three codes in this theme were often used together as participants described how the pandemic affected study-related behaviors both directly and indirectly.

Overall, participant responses in this theme reflected a high degree of acceptability for behavioral intervention while dealing with new challenges. Participant responses revealed how they took COVID-19 seriously, acknowledged the unique challenges that the pandemic created, and described the challenges impacting them through a multitude of other factors. The impact of the COVID-19 theme encompassed three sub-themes; descriptions of each and exemplary quotations are provided to illustrate transcript extracts about each sub-theme.

1) *The Impact of COVID-19 on Diet and Exercise* focused on how COVID-19 impacted participants' study intervention diet and exercise behaviors. In most participant comments, COVID-19 restricted the ability to leave the house, therefore limiting access to exercise or normal grocery shopping patterns.

"I haven't been out of my house for the past three, four weeks. I've been stuck here at home. And I'm trying very hard to continue the eating habits that I've been taught. But yes, going out and the activity the physical activity part is what has impacted me." -B07 (Female, age 66).

"You go to the grocery store, there's only so many things you can buy... I think my biggest thing is I was very active, very aggressive on the aerobic equipment and I don't have that now because you can't go to the gym. I tried to do some workouts around the house. It gets boring running up and down the stairs back and forth. But you walk around the neighborhood, gives you a little bit of exercise. You know that's kind of where I'm at." -B17 (Male, age 66).

2) *Deviation from Normal and Trying to Stay on Track* focused on how COVID-19 created a deviation from the normal routine a participant was used to, as well as comments of trying to stay on track through uncertain times while adjusting to a new normal.

"I think it's been difficult for us because we've had to adjust also to trying to help with home-schooling grandchildren. That's sort of thrown our dietary schedule and our exercise into a new normal that we're trying to now figure out how to manage all of it." -B05 (Female, age 78).

"...[B]ut the other thing is just the habit of doing [the intervention] and keep in doing it has really made a difference during this unexpected change in our situation." -B12 (Female, age 76).

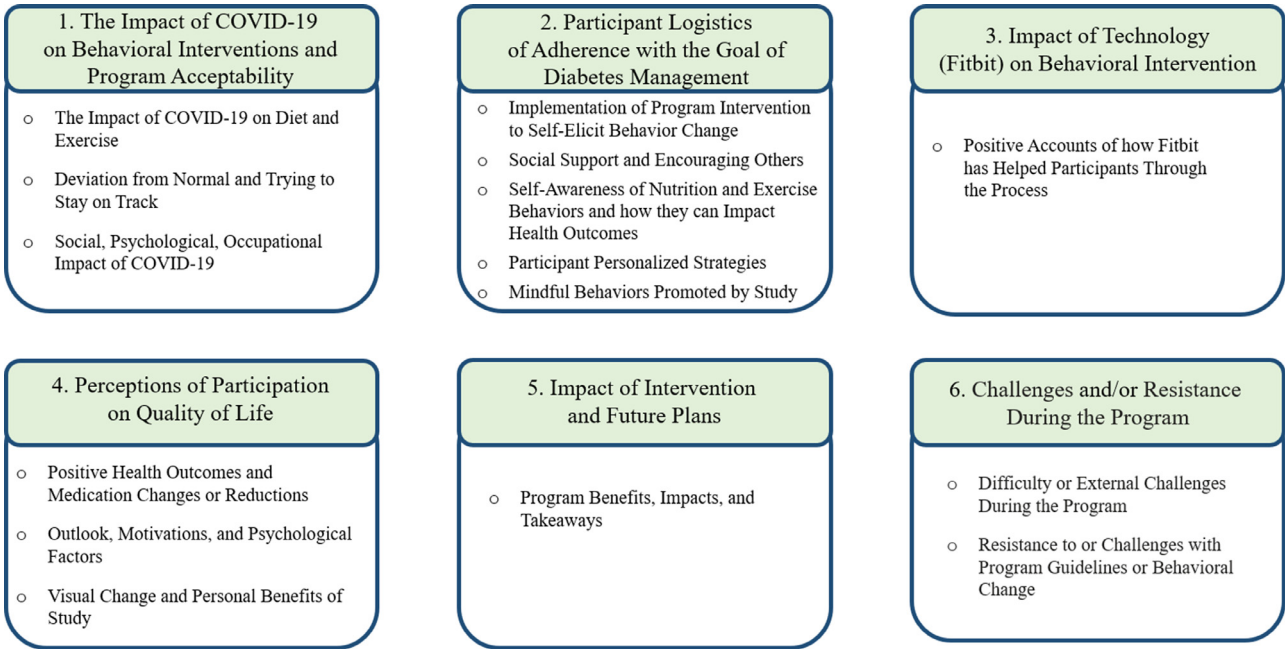

Fig. 1. Summary of focus groups themes and sub-themes.

3) *Social, Psychological, Occupational Impact of COVID-19* focused more on the non-study related factors of COVID-19 such as the impact on social interaction, psychological outlook during the pandemic, at-home occupational activities participants engaged in, and how this can potentially impact the previous diet and exercise modifications made during the behavioral intervention.

"I live one day at a time and just like this virus every day something different happens. So, I don't worry about what's going to happen tomorrow with the virus. The thing is what's happening today with the virus is enough to know and so if you just focus on living the best day that you have and be joyful why be sad." -B12 (Female, age 76).

"Just kind of staying in the house a lot or going outside and sitting around and trimming the grass and things. Other than that, things are going good." -B19 (Male, age 71).

2. Participant Logistics of Adherence with the Goal of Diabetes Management:

This theme focused on the logistics of adherence and acceptance of study interventions by participants as they worked toward the goal of self-managing/monitoring diabetes. Participants discussed taking an active role in the implementation of behaviors learned during the study and finding ways to implement them into a daily routine. This theme also displays how participants were able to adhere to program demands, such as personalized strategies for success or strategies learned through mindful behaviors promoted by the study. In addition, the benefits from support and encouragement that participants either received from others or provided to others, as well as the realization of how mindful eating and exercise can impact health are explored here. This theme had five subthemes; descriptions of each and exemplary quotations are provided to illustrate transcript extracts about each sub-theme.

1) *Implementation of Program Intervention to Self-Elicit Behavior Change* focused on participants taking an active role in their health management and finding ways to implement program guidelines into their life. These included creating a daily routine, self-eliciting or choosing behavior change, and utilizing the interventions delivered in the program to change behavior and improve health.

"Well, the thing is, it's making up your mind to do what you're being taught and putting [it] into play in your activities of daily living. I think once you say, 'I'm going to do it." -B12 (Female, age 76).

"Going to the gym is just a part of the routine now, not as much of a burden that it was before." -B01 (Female, age 70).

2) *Social Support and Encouraging Others* focused on the support and encouragement that participants either received during the group sessions or that participants encouraged others in doing. In addition, several study participants recommended friends and family members join the study after beginning their participation. For example, participant B01 encouraged their friend to join the study, who later became participant B10.

"...[N]ot having foods in the house that are challenging to resist, inviting people over for no leftovers, also enjoying the company...Getting friends to help and encourage- [you] need to keep them informed of your journey." -B01 (Female, age 70).

"And I think I've actually talked my wife into joining me now. She's been reluctant in the past, so she's kind of seen seeing my results. I think she's a little bit jealous. So everything's working out good for me." -B20 (Male, age 68).

3) *Self-Awareness of Nutrition and Exercise Behaviors and how they can Impact Health Outcomes* focused on participants realizing how setting goals for eating and exercise has impacted their health. This included either general awareness of overall health or realizing how a specific nutrition or exercise behavior can have an impact on a health outcome, such as adjusting dietary fat and carbs to directly control blood sugar levels.

"Everything that you've taught has been wonderful information for someone that has diabetes to realize that your behavior really makes a difference and how you are going to manage it. [Seeing the] mindfulness needed to enact deliberate change and the results that are seen from doing so... believe me, it really has taught me so much how your behavior and the way you eat, and exercise impacts your diabetes" -B12 (Female, age 76).

"And, you know, if I reduce the fat. . . and this includes carbs, too. But you see my blood sugar came down." -B17 (Male, age 66).

4) *Participant Personalized Strategies* focused on strategies that were not specifically discussed within the program, but which participants described undertaking of their own volition while participating in the study to assist in their behavioral lifestyle intervention change.

"And I took on that challenge of a boot camp and that was exciting. Yeah, my instructor started up again on as a webinar..." -B08 (Female, age 69).

"But [I'm] doing a vegan diet and I'm really happy with that, it's really helpful." -B15 (Male, age 69).

5) *Mindful Behaviors Promoted by Study* focused on the strategies for behavioral change that participants learned through the program, such as mindful behaviors, all of which also assisted in the participants' behavioral lifestyle change.

"Some of the strategies [I used were] hiding the snacks or not buy them. Checking ingredients to see what the ingredients are in the food for me. . .smaller plates and then also eat the food slow and savor the food and taste it and enjoy it. That's the strategy I used." -B15 (Male, age 69).

3. Impact of Technology (Fitbit) on Behavioral Intervention:

In this theme, participants discussed the acceptability of Fitbit devices, giving positive reports for how the technology kept them accountable, helped in recording behavior by automatically tracking activity, and sparked the motivation for healthier behaviors. This theme had one sub-theme; a description and exemplary quotation are provided to illustrate transcript extracts about this sub-theme.

1) *Positive Accounts of how Fitbit has Helped Participants Through the Process* focused on the positive impacts, benefits, accountability, and helpfulness that Fitbit provided, such as participants entering their daily food intake facilitating adherence to the study intervention. Other examples include participants being able to see the number of calories taken in versus expended and how the nutritional breakdown of food helped them further determine which foods were better to eat over others. In addition, participants noted that Fitbit helped them to track progress, structure physical activities, create and work on goals, and to know when goals were met/unmet—all of which increased their motivation to engage in physical activity.

"Fitbit has spurred an awakening in me. I was amazed how much motivation the Fitbit encouraged me and instilled a genuine yearning to accomplish goals and reach for peaks. I had never counted calories before. I had never had a structure for regular exercise. I had never tracked my daily weight. Now, I am much more in tune with my body, and I crave working on my goals with dedication... When the Fitbit was activated on my phone, it was an adventure for me, and it amazed me about the technology interaction. My daily life has wonderfully changed by using the Fitbit and participating in the study." -B20 (Male, age 68).

4. Perceptions of Participation on Quality of Life:

Overall, participants mentioned how their quality of life was improved throughout the study and praised the positive impacts of the study intervention during the focus group discussions. Within this theme, participant comments took a deeper look at perceived program impacts, as they mentioned specific improvements in their body weight and diabetes and branched into how it affected their perceptions on quality of life. There are three sub-themes in this theme; descriptions of each and exemplary quotations are provided to illustrate transcript extracts about each sub-theme.

1) *Positive Health Outcomes and Medication Changes or Reductions* focused on participants describing their diabetes medication(s) being reduced by their providers, lowered A1c numbers, more control over blood sugar numbers, and weight loss achievements; all of which contributed to an overall improvement in the quality of life.

". . . [I experienced a] reduction in diabetic medication, saving lots of money per month, improved blood sugars, fasting [blood sugar] below 100. . . Chronic pain is down from 3 to 1. Fall risk is reduced on every parameter, walking without walking stick. Stair climbing (not using both feet on each step like I was doing before) and way more activity." -B01 (Female, age 70).

"I actually went to the doctor yesterday and they just took me off of, you know, one of the blood pressure medicines. . .So it's been a lot of good progress for me." -B17 (Male, age 66).

2) *Outlook, Motivations, and Psychological Factors* focused on the participants' general outlook on quality of life as well as the psychological factors, incentives, and motivations that participants experienced such as feeling confident, enjoying seeing their progress, and having a positive outlook on their health.

"I'd say that this study actually influenced my quality of life because I'm going in the right direction." -B20 (Male, age 68).

"[M]y level of attention and consciousness to food is way higher than it was before I started the study... but the other thing is just the habit of doing it and keep in doing it has really made a difference during this unexpected change in our situation." -B01 (Female, age 70).

3) *Visual Change and Personal Benefits of Study* focused on the personal benefits and visual change contributing to the quality of life. These are benefits and changes which were either noticed by the participant themselves, or by others around them and included benefits and changes such as clothes fitting better, clothes becoming too big, friends telling them that they look better, or friends commenting that they look more physically fit.

"I am able to wear clothes that I haven't been able to wear for two to three years. So, the clothes that I was wearing when I first started this study, just too big. That's quite a big change. It just makes me feel good that I'm making progress." -B20 (Male, age 68).

"Looking better, good, healthier and younger [in response to appearance-related benefits]." -B03 (Female, age 69).

5. Impact of Intervention and Future Plans:

In this theme, participants discussed the impact that the behavioral intervention had on their lives and how it might lead to success in the future. Participants made comparisons to various aspects of their lifestyle before the program and how this was compared at present during the focus group discussion. Participants discussed their new goals for maintaining these behaviors acquired during the study and plans to continue even after completion of the study. This theme has one sub-theme; a description and exemplary quotations are provided to illustrate transcript extracts about this sub-theme.

1) *Program Benefits, Impacts, and Takeaways* focused on participant discussions of the benefits, helpfulness, impacts, and takeaways for the future goals created from the program.

"I am doing way better than I was. Don't mind looking forward to the next 20 years whereas before I was really worried about it. Due to not being a dieter- to see the weight come off- basically painlessly was great. And to see that I had to up my activity level was also very important." -B01 (Female, age 70).

"Since joining the program, I've learned how important the physical activity is, what we eat, and the amount that we eat. That's been the benefits that I have gotten that I've been more aware, more conscious." -B07 (Female, age 66).

"And so my goal is to keep it there (A1C being low) and actually do better. And I'll continue to lose my weight." -B20 (Male, age 68).

6. Challenges and/or Resistance During the Program:

In this theme, participant comments described overall challenges and/or resistance to the program stemming from the individual participant. These challenges came either from previous or outside challenges experienced by participants or came from resistance with study materials such as using Fitbit. This theme had two sub-themes, each related to the type of challenge and/or resistance met by participants during their behavioral lifestyle intervention journey.

1) *Difficulty or External Challenges During the Program* focused on challenges that the participants typically had little control over and therefore added a level of difficulty to the program's interventions. These were commonly physical impediments that happened before the study began, such as a chronic injury.

"So I really want to you know, I kind of slowed down because my knees [previous injury] have been bothering me. But I'm going in the right direction. And even though I'm maybe going a little bit slower because of my knees, you know, I'm still progressing in the right direction." –B20 (Male, age 68).

2) *Resistance to or Challenges with Program Guidelines or Behavioral Change* focused on participants' resistance to lifestyle changes that they were encouraged to implement. Most challenges seen in this code dealt with participants who were either resistant to change in the beginning or had challenges in operating a new piece of technology such as trying to figure out how to better use Fitbit.

"Then at the very beginning, I have to admit that I didn't really follow like I should have. It's been only maybe these last three months that I've kind of gotten the bull by the horns like they say, and really have started integrating." -B12 (Female, age 76).

"I liked it [Fitbit] but. . .I don't think it's very intuitive at all. Once you learn it it's not too bad, there's a fairly steep learning curve for the Fitbit app. I found that what worked the best for me [was] when I recorded after every meal. It was a bother, but it worked the best because if I waited till the end of the day, I tended to eat too much." -B10 (Female, age 65).

Discussion

In this study, we explored the acceptability and participant experiences of a behavioral lifestyle intervention using Fitbit technology to manage T2D in overweight/obese older adults amid the COVID-19 pandemic. Overall, these findings demonstrated participant acceptance of the intervention, as well as Fitbit technology for self-monitoring of diet and activity. To further this point, although one might expect reduced interest in the program due to disruptive stressors related to the pandemic, participant responses reflected a high degree of acceptability for the behavioral intervention while dealing with new challenges. Overall program acceptability was observed in the participant descriptions of mindfully tracking their diet and physical activity through the Fitbit application, as well as enthusiasm in their plans to continue to track behavior using program strategies.

The behavioral lifestyle intervention increased awareness of self-monitoring strategies, facilitated by using Fitbit, in a sample of overweight/obese older adults with T2D. These findings are consistent with pilot studies which also reported on the importance of behavioral interventions focused on diabetes self-monitoring, and show an overall positive effect on overweight/obese adults with T2D.[11,23] In addition, the Look AHEAD clinical trial demonstrated that a behavioral lifestyle intervention improved weight loss and glycemic control in overweight/obese adults with T2D compared to standard education.[24] Our study further supported that older adults (65 years or older), can utilize mHealth technology to assist with behavioral modifications and increase the effectiveness of their diabetes management through self-monitoring practices. Participant comments about enjoying the use of Fitbits to aid in self-monitoring, gaining confidence in decision-making processes, and creating and promoting goals to facilitate mitigation of complexities associated with diabetes have also been supported in the literature.[25–27] Acceptability of a mobile health app as a component of a behavioral lifestyle intervention is promising as a way to help older adults with T2D. Resistance to the intervention mainly came from a lack of familiarity with the Fitbit technology, as well as physical limitations with which the participants entered the program. These challenges indicate a possible need for dedicated training with technology use at the beginning of the program and the potential for additional or refresher training during the sessions for participants as needed. Still, it is important to recognize that the average age for study participants was 72 (± 5.4) years old and thus the findings may not be transferable to older individuals.

Although the original plan to conduct face-to-face group sessions, this was interrupted by COVID-19. Despite this disruption, only minor setbacks were noted. Adaptation to a virtual delivery format (WebEx) encouraged participants to use the behaviors learned in the program to adapt to the changing setting (e.g., set a routine). It has been reported that several providers and research studies have adapted to technology during the COVID-19 pandemic.[28] Likely, technology will play a greater role in both clinical and self-management of diabetes even once lockdowns ease, especially in vulnerable older populations where transportation may be limited.[28] The acceptability of a digital intervention during a time of crisis may also have important implications in communities prone to natural disasters and displacement, such as those at risk of fires and hurricanes.

Strengths & limitations

Our findings build upon current evidence supporting the acceptability of chronic illness management through self-monitoring apps and extend current findings by demonstrating acceptability among an older

adult population with T2D and other chronic conditions. However, this study has some limitations. For example, we did not include a control group to participate in the intervention without a Fitbit device, lessening our ability to compare the perceived value-added with this component. Further, because of the need to adapt to social distancing restrictions due to the COVID-19 pandemic, group 1 experienced a different approach to deliver the interview than the remaining groups. Thus, their comments may reflect a different experience than the other groups. In addition, our study recruited older adults with an average age of 72 (+/- 5 years). As this was the younger spectrum of older adults, it is possible that these findings are not transferrable to older adult individuals above this age bracket. Another limitation is the possibility of performative aspects of qualitative interviewing. Participants may have been more likely to share positive perspectives and success with the behavioral intervention if this is what they believed researchers wanted to hear.[29] This concern, however, is mitigated given that we did also find evidence of participants admitting to non-adherence, indicating participants felt comfortable sharing negative experiences. As researchers, our perceptions were another source of bias, noted as preconceptions. To manage this source of bias, we engaged in reflexive practice throughout the study period, including thorough iterative group discussions while analyzing interview transcripts.[30]

Conclusion

This study assessed the acceptability and participant experience of a behavioral lifestyle intervention using Fitbit Technology in overweight/obese older adults to manage T2D amid the COVID-19 pandemic. Notably, among the themes generated from the analysis of focus group transcripts, participants communicated plans for continued change and implementation of behaviors even after the program end, which is an indication that: 1) participants found value in the behavioral lifestyle intervention, and 2) the positive behavioral change may continue beyond the 6-month study intervention period. Participants discussed how they could adapt to better adhere to behavioral change by overcoming COVID-19 related challenges, continue to implement and use mindful behaviors and personalized strategies, and regularly use the Fitbit device to monitor their behaviors. Participants described how the intervention impacted their life and helped them overcome external challenges. The need to adapt to stressful external circumstances, such as COVID-19, may support the future application of healthy behaviors during other stressful life events beyond the study timeline. This qualitative study serves to fill the current gap in the literature on the acceptability and patient experience of behavioral lifestyle interventions, specifically in using Fitbit technology in overweight/obese older adults to manage T2D amid a worldwide pandemic. These findings provide support for the use of personal fitness devices for self-monitoring of multiple health behaviors to manage T2D and other chronic conditions in older adults. Future research should examine long-term adherence to behavioral modifications and their effects on long-term outcomes.

Declaration of Competing Interest

None.

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Conflict of Interest Disclaimer

No conflicts of interest were reported by the authors for this study.

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