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Use of the FITT framework to understand patients' experiences using a real-time medication monitoring pill bottle linked to a mobile-based HIV self-management app: A qualitative study

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Abstract

Objective—The purpose of this work was to conduct an in-depth analysis to understand patients' experiences using a real-time medication monitoring pill bottle linked to an HIV self-management app.

Methods—A descriptive qualitative study design was used. In-depth interviews were conducted using a semi-structured interview guide at the 3-month follow-up visit during a trial of the app for improving medication adherence which began in January 2018. Eligibility criteria were HIV-positive, over the age of 18, ownership of a smartphone, able to speak and understand English and self-report less than 80% adherence to medications in the past 30 days or a viral load of over 20 copies/mL (detectable). All interviews were audio-recorded and transcribed. Using thematic analysis we explored emerging themes with similar patterns across interviews and organized the themes according to the constructs of the Fit between Individuals, Task and Technology (FITT) framework.

Results—Thirty-eight persons living with HIV, who were randomized to the intervention arm of the study trial, participated in the interviews. 79.0% of participants reported their race as African American/Black, 63.2% had completed some high school or less, and 79.0% reported an annual median income of less than $20,000. Data was collected until saturation was reached. A total of nine major themes organized by the FITT framework were identified. Three themes related to the fit between individuals and task were: motivation for strict medication adherence, self-efficacy for overall health management, and engagement with medication reminders. Four themes related to the fit between individual and technology were: ease of use, HIV-related stigma and disclosure of HIV status, customized alert of medication time windows based on individual routine set-up, and preference for device design. Two themes related to the fit between task and technology were: system functionality of data transfer from the electronic pill bottle to the app and self-awareness of system syncing signals.

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Conclusions—This study demonstrated that tracking medication adherence and receiving push-notification medication reminders through the electronic pill bottle connected to the app encourages and supports PLWH in adhering to their medication regimens. Findings from this work highlight the importance of adequate consideration of the needs of intended users in designing customizable mobile health technology, including HIV-related stigma, disclosure of HIV status and antiretroviral therapy regimens.

Keywords

mobile applications; medication adherence; medication compliance; real-time monitoring; electronic pill bottle; mobile Health; HIV/AIDS

1. Introduction

Use of mobile technology in healthcare has expanded.[1,2] Mobile health (mHealth) technology offers the opportunity to empower patients to engage in their own healthcare, by allowing patients to self-manage their health conditions.[3,4] Further, mobile self-management apps have successfully improved health outcomes such as medication adherence, engagement in healthy behaviors and health-related quality of life.[5–8] Recent evidence supporting feasibility and acceptability of mHealth interventions for improving medication adherence and self-management in chronic diseases is growing.[9–14] Building on this evidence and specific to persons living with HIV (PLWH), a symptom self-management app was found to be efficacious in improving symptom frequency and intensity and medication adherence in persons who used the app as compared with those in the control group (p=0.017).[15] However, in these studies, medication adherence was limited to a self-report measure as a secondary outcome, which has limitations including reporting bias and over-estimating adherences.[16,17]

Strict adherence to antiretroviral therapy (ART) among PLWH is essential to sustain viral suppression, prevent progression to AIDS and opportunistic infections, improve overall health and reduce the risk of sexually transmitting HIV to partners.[18–20] Despite the known importance of taking HIV medication as prescribed, PLWH's non-adherence remains a critical problem. Several reasons such as HIV stigma, questioning efficacy/dosing of ART, and interactive toxicity beliefs regarding alcohol/drugs are associated with poor adherence.[21,22] Additionally, existing literature shows that the most commonly selected barriers to ART among PLWH were being 'away from home', 'simply forgot', 'change in daily routine', and 'fell asleep through dosing time'.[23] Approximately half of PLWH in the US are virally suppressed, indicative of the importance of improving long-term medication adherence using effective interventions to address existing barriers and enhance the HIV care continuum.[24] For example, mobile interventions utilizing mHealth technology have been effectively used to monitor adherence to anti-depressants and schizophrenia and provide real-time adherence counseling in PLWH.[25–27]

For the success of the long-term HIV care interventions utilizing mHealth technology, it is essential to support the quality of technology in PLWH's use because use of technology and user adoption is closely related to the usability of the system.[28,29] Usability is the

measure of the quality of a user's experience and is assessed through the interaction of user, system and task in a specified setting.[30,31] Technology produced with poor design and inadequate consideration of the needs of their intended users will likely be misused or underutilized.[32] Thus, it is necessary to ensure that technology works properly to achieve users' goals.[33] This can best be achieved through an in-depth understanding of users' experiences in their everyday lives relevant to the use of mHealth technology, by including intended users' input in the design process, and identifying needs of the targeted users and taking into consideration of specific aspects of the technology throughout the development process.[31,34–37]

Study Context

Using an iterative design process,[38,39] our study team developed the 'Wise App', an HIV self-management app with real-time medication monitoring.[40] The Wise App is comprised of testimonial videos of PLWH, push-notification reminders for medication adherence and physical activity, a medication tracker, health surveys and to-do lists outlining wellness tasks for the day (i.e., taking medication and walking steps) (Figure 1).[41,42] Specifically, the app is tailored to help PLWH self-manage their health and is linked to an electronic pill bottle to monitor medication adherence and a fitness tracker to monitor physical activity (Figure 2). This study focused on the electronic pill bottle, one of the two connected devices with the Wise App.

The Wise App is linked to an electronic pill bottle, the CleverCap™ LITE (a diameter of 2" and a height of 1.35"). This pill bottle records when the pill bottle is opened for medication ingestion and transmits patient identifier and date-time stamp over existing cellular networks in real-time. The CleverCap™ LITE beeps every time it is opened. Once closed (closed at least in five seconds after being opened), it flashes and sends a signal to a cloud, connecting with a cellular device/app (Wise App).

2. Objectives

The purpose of this work was to conduct an in-depth analysis to understand patients' experiences using a real-time medication monitoring pill bottle (CleverCap™ LITE) linked to an HIV self-management app among PLWH (Wise App).

3. Methods

This was a descriptive qualitative study using in-depth interviews. The Institutional Review Board of Columbia University Medical Center reviewed and approved all research activities.

3.1. Sampling and Recruitment

Following the iterative development of the Wise App, we began a randomized controlled trial in January 2018. Our study seeks to enroll 200 PLWH into a 6-month trial (100 randomly assigned to the intervention group, 100 to the control group). Inclusion criteria are: HIV-positive, over the age of 18, ownership of a smartphone, able to speak and understand English and self-report less than 80% adherence to ART medications in the past 30 days or a viral load of over 20 copies/mL (detectable).[43] Using flyers and posting on

social media, participants were recruited from clinics at Columbia University Medical Center/ New York-Presbyterian Hospital and community-based organizations across New York City.

At the baseline visit, study participants were provided with two devices, an electronic pill bottle and a fitness tracker, linked to the Wise App. Participants in the intervention group receive push-notification 'medication' reminders based on the use of the electronic pill bottle. At the 3-month follow-up visit, intervention group participants were invited to participate in a one-on-one in-depth interview to share their experiences using the electronic pill bottle linked to the Wise App.

3.2. Procedure

Each participant was given an explanation of the study and signed an inform consent form prior to participation. Using a semi-structured interview guide (Table 1), participants were encouraged to describe their experiences with the electronic pill bottle linked to the Wise App in their everyday settings. All interviews were audio-recorded with two digital recorders to safeguard against mechanical failure.

3.3. Data Analysis

Descriptive statistics using SPSS version 24.0 (IBM Corp, 2015) were used to analyze demographic information. Research team members (HC, GF and MS) independently reviewed the transcripts of the audio recordings, two research team member (GF and MS) independently generated a set of codes from the line by line codes via inductive content analysis and a third (HC) reconciled coding discordance between the other two GF and MS. [44,45] Thematic analysis was used to identify themes with similar patterns across interview data. Discrepancies in the themes were discussed until consensus was achieved. A codebook was developed using Excel. Free text excerpted from the transcripts was entered into the codebook followed by each of the themes.

The Fit between Individuals, Task and Technology (FITT) framework was used to guide the coding of the interview data.[46] Each of the themes in the codebook was categorized into the constructs of the FITT framework: fit between individual and task, fit between individual and technology, and fit between task and technology. The FITT framework postulates that adoption of health information technology (IT) depends on the fit between the attributes of the individual users (e.g., motivation), attributes of the technology (e.g., usability, functionality, performance), and attributes of the tasks and processes (e.g., task complexity) (Figure 3). In the FITT framework, an 'individual' signifies an individual user; 'technology' represents for the interaction of tools needed to accomplish a given tasks; 'task' comprises tasks and working processes that should be completed by the individual user and that are supported by the given technology. The FITT framework facilitates an in-depth analysis of a variety of interconnected factors further influencing the success or failure of technology adoption.[47–49]

4. Results

4.1. Sample

Thirty-eight PLWH participated in the in-depth interviews (Table 2). The mean age for study participants was 47.6 years (*SD*=10.9; range 26–68 years of age). The majority (n=30; 79.0%) of participants reported their race as African American/Black, and 15.8% (n=6) of participants self-identified as Hispanic/Latino. 60.5% (n=23) of participants were female, and half the participants (n=19; 50.0%) were single. 63.2% (n=24) of participants had completed some high school or less. 79.0% (n=30) of participants reported an annual median income of less than $20,000, although 15.8% (n=6) of participants reported that they did not know their annual incomes.

4.2. Findings

We identified nine major themes which were organized by the following constructs: fit between 1) individual and task, 2) individual and technology, and 3) task and technology (Table 3).

4.2.1. Fit between individuals and task—

The three themes related to fit between individuals and task were: 1) motivation for strict medication adherence; 2) self-efficacy for overall health management; and 3) engagement with medication reminders.

Motivation for strict medication adherence: Participants understood the importance of adhering to their medication regimens but still found it challenging. Participants expressed that using the electronic pill bottle motivated them to take medication, and they were better able to track their medication adherence as well. Several participants stated, *(P027) "My experience with the pill bottle is that it keeps me motivated. It also helps me know basically when it's time to take my medication." (P005) "It gives me more encouragement to take my medication on time every day." (P070) "It has been very useful with me taking my medication. Whereas on average I probably would miss taking my meds maybe eight or ten times out of a month, now I don't hardly miss. If anything, it's maybe three times a month. I know I should take my med. I am improving." (P041) "This has helped me keeping track of my time, and taking it [medication] every day at the same time. Hopefully, by the end of my study, I will do it automatically because I will be already adjusted to the time." (P081) "It keeps me on track of the medication I'm taking and trying to get my viral load and T-cells at a level where it's supposed to be."*

Self-efficacy for overall health management: Participants wanted to improve their general physical health. Participants expressed self-efficacy for health management by monitoring medication adherence through the electronic pill bottle linked to the Wise App. Participants mentioned, *(P004) "It helps you to keep track of your meds… then your general health... I guess that's why they called it Wise App… it's been real helpful. I feel I can take care of my health" (P029) "…like I say, the Wise App and pill bottle, which has kind of made me more active. Like to be more present in what I am doing in life…" (P081) "I would keep using it, to keep my health above water…I would recommend anybody to use it."*

Engagement with medication reminders: Participants described how they often forgot to take their medication on time every day and the electronic pill bottle facilitated adherence to their medication schedule. Several participants highlighted the need for reminders to take medication exactly as prescribed. They explained, *(P039) "Like when I have a busy day and my memory is not too good, because I'm running around doing stuff and I'm living life like I'm supposed to, it reminds me on my phone by putting a message. And it comes up. And I look at my phone. And I notice; oh my god. I didn't take my medicine."(P055) "Like I would go four days without taking it. Or my memory is short now. And my memory is not as much as good as it was before. So I really need this to help remind me to take my medication."* Participants appreciated receiving push-notification medication reminders to encourage adherence to their daily medication schedule (i.e., whether they did or did not open the electronic pill bottle on time every day). Several participants mentioned, *(P004) "It gives me more time with my medication because I wasn't – I'd know to take it, but I didn't have a reminder, so this has been a real reminder to me, and it's helped me to stay on it…" (P055) "I mean I feel like now it's more efficient. It's a lot easier. And in terms of like it pops up, so it's in my conscience. And I won't dismiss it unless I take it. So even if I pass let's say the timeframe, I still know that I need to take it. So I'll still take it." (P089) "I think the reminder is very useful…When I read that, it's like; 'Oh, is it almost time?' That helps a lot because I just pick up my phone and it's just there."*

4.2.2. Fit between individuals and technology—

The four themes related to fit between individuals and technology were: 1) ease of use; 2) HIV-related stigma and disclosure of HIV status; 3) customized alert of medication time windows based on individual routine set-up; and 4) preference for device design.

Ease of use: Some participants reported that the electronic pill bottle was easier to open than their regular pill bottles. Several participants described, *(P002) "It's easy to open. So it's a little easier to open than some of my regular pill bottles. I've got to fumble with them to open them up."* Moreover, many participants thought the translucent bottle made it easy to check the number of pills left in the pill bottle. Another participant said, *(P029) "I can automatically know to pour it – I don't have to shake it to see how many is in there. I can see and it's easy to fill."*

HIV-related stigma and disclosure of HIV status: Participants explained how some of their concerns about HIV-related stigma and disclosure of HIV status were resolved through the use of the electronic pill bottle. They described the discreteness of the electronic pill bottle since it does not have any HIV medication labels (this facilitated privacy regarding their HIV status). Some participants elucidated, *(P004) "Now when you have the bottle from the pharmacy, it says Reyataz or Epzicom or whatever. That one [electronic pill bottle], that don't say what it is. It could be any pills, any medications. So it's not like an indicator that people know me HIV…" (P041) "It's more...discrete, discrete... It doesn't show what medication I am taking…because it doesn't say it on the bottle." (091) "I'm comfortable pulling this out and taking the pill, instead of pulling my medicine out...This thing's got nothing to do with HIV. So I'm clear on that."* In addition, one participant recounted how she was able to maintain privacy with the electronic pill bottle when around her family. She

stated, *(P029) "I've been HIV for 20 years. I have a 19-year-old daughter. And I've never disclosed to her my HIV status. So she asked me one day about it. I told her, I said, it's for pain medicine. The pill box is not marked like that, you know. You can't read that it's an HIV-related pill bottle. I am happy to have it."*

Customized alert of medication time windows based on individual routine set-up: Participants thought the customized medication alert was a useful feature, because they were able to tailor medication reminders around their meal/bed times on the app in connection with the electronic pill bottle. Several participants stated, *(P043) "I like it. It really helps, especially if you're having a busy day, you're running late, or you're running around." (P006) "It is a good fit with my life. I had 10 o'clock. That's what I'm aiming for. But, normally I stay up so late at night that I take it, like in the three hours of the morning. I'm trying to change that routine and trying to at least take my pills before midnight." (P044) "It's just that I was missing the timeframes, because of my schedule. So it was frustrating. But then once I changed the routine and I realized, okay the mornings are better… it's just easier for me. I just changed that around. And then it got a lot less stressful."*

Preference for device design: Several participants explained that the electronic pill bottle was too small to fit their whole medication regimens or was too large to conveniently carry with them. Additionally, some participants found the lights to be exceedingly flashy and found the beeping irritating, especially when trying to conceal that they were taking medication. Participants described, *(P008) "I really like this pill bottle. However, the only thing I have against this pill bottle is that I take more of the pills. I need bigger one." (P009) "Well, first of all I left it home – I didn't have to travel with it because it was very difficult to travel with. Because you would have to carry something big enough to carry the bottle, because it's very delicate." (P051) "It lights up. And it's just, I don't know. I live with my girl. So it just notifies every time I'm taking it or not taking it. So it's just a conversation I don't want to have. So I just move it to the side." (P084) "…if I were to take it with me or something like that, it's a little too bulky for just a pocket. Certainly in the summer, this would be brutally inconvenient for me."*

4.2.3. Fit between task and technology—

The two themes related to fit between task and technology were: 1) system functionality of data transfer from the electronic pill bottle to the app; and 2) self-awareness of system syncing signals.

System functionality of data transfer from the electronic pill bottle to the app: Some participants experienced technical issues such as the data not syncing between the electronic pill bottle and the app as prescribed by the CleverCap™ LITE. For example, some participants received push-notification medication reminders even after they had taken their medication. A few participants reported their technical problems by stating, *(P006) "So I feel when it doesn't beep it's a problem. It just won't get it if it don't beep right… sometimes it doesn't register that I took it at that time." (P043) "Once in a while, even though I've taken it, it doesn't update my phone for a couple of hours. I would be thinking that I wasn't taking my meds? And then I thought I broke it, which I didn't. There was*

something wrong with it." (P033) "There was a few times though that it would register zero, that I took zero of the meds. And I took them."

Self-awareness of system syncing signals: Participants enjoyed the feedback of the flashing and beeping after taking their medication and felt reassured that the app was synching with the electronic pill bottle to accurately keep track of their adherence. Participants said, *(P039) "…I took my medicine, closed it up. And I said; okay, it's going to flash. And then when it flashed, I know it registered to my phone. So it's good to know." (P073) "I like that it lights up, and it connects to the phone, and that the phone knows you took your meds. I can see it. I can know it right away."(P033) "…listen for that click. And then you see lights flashing. And then you go back and you see the task is done."* However, a few participants did not understand the connection between the device beeps/flashes after pills were taken and when to know if the bottle is working. Some participants stated, *(P004) "It's like beep-beep. Like what's that beep-beep? Confusing…" (P081) "It just, it gets me nervous sometimes because I'm not use to the flash…I'm like; where is this light coming from?"*

5. Discussion

With the increased use of mobile technology in healthcare, there is a need to better understand how patients use mHealth technology to self-manage their care.[31] We used the FITT framework to explore our patients' experiences with the electronic pill bottle linked to the Wise App. Our study sample predominantly included underserved PLWH, particularly racial minorities and those from low-socioeconomic groups who have low annual incomes and low levels of education. This is an important strength to our study given that HIV disproportionately affects persons from underserved communities who have an increased risk of non-adherence to HIV medications.[50–53]

mHealth technologies have played significant roles in supporting HIV-related treatment for PLWH. Existing evidence suggests that mHealth tools can enable behavior change and improve clinical outcomes.[54–58] ART medication adherence is one of many modifiable health behaviors that can be targeted through the use of mobile devices.[17,56,57] A similar electronic pillbox for real-time medication monitoring was pilot-tested in a small sample of PLWH in resource-limited settings; the data of medication monitoring was accessible only to 'research staff' and used for counseling in PLWH.[59,60] However, real-time medication monitoring could also be used for supporting medication adherence for 'PLWH'. Given that the most frequent reasons for non-adherence in existing literature include 'forgetting taking medication', real-time notifications to PLWH should be provided followed by real-time medication monitoring.[22,61,62] In this study, engagement with medication reminders was a major theme related to the fit between individuals and task, as participants emphasized the importance of having system reminders when they did not take medication. Findings from this study suggest that the electronic pill bottle, when connected to the app's real-time medication adherence monitoring and push-notification medication reminders, may be synergy for PLWH to monitor and take medication without forgetting over time. It is critical that future development of real-time monitoring mobile devices directly send feedback, not only to researchers/healthcare providers, but also to the actual users -- patients.

In this study, a theme related to the fit between individual and technology was HIV-related stigma and disclosure of HIV status.[63,64] Stigma has been a persistent challenge associated with HIV. For example, the Joint United Nations Programme on HIV and AIDS (UNAIDS) highlights that HIV-related stigma can prevent PLWH from accessing HIV health services.[65] Further, HIV-related stigma negatively affects PLWH's lives, resulting in non-adherence to treatment and decreased HIV disclosure.[66] Disclosure of HIV status is one barrier to the rights and health of PLWH, as it may result in denial of employment, violence, and other collateral consequences even among family.[67] Some participants suggested that use of the electronic pill bottle allowed them to overcome these concerns because the pill bottle did not have labels of HIV medication. These findings have significant implications for the future design of mHealth systems to reduce stigma. Opaque pill bottles without labels of the name of medications can prevent from disclosing patients' medical information including their HIV status and/or lists of their medications.

Another theme related to the fit between individual and the electronic pill bottle linked to the Wise App was the design preference of the pill bottle. Regarding the aforementioned HIV-related stigma and disclosure of HIV status, while many participants liked the fact that the electronic pill bottle lacked HIV medication labels, a few participants expressed concerns around the lights (e.g., 'too flashy') and beeping (e.g., 'irritating'). Poor design that does not meet the user's needs is one of primary reasons why many systems fail to accomplish their objectives.[32,41,68] Although the flashing and beeping was a feedback of taking medication and keeping track of medication adherence, it is critical to address users' concerns and incorporate this feedback (i.e., users' requirements) into future designs so users can be more engaged with the systems. Furthermore, participants' preferences around the pill bottle's size were closely related to their individual ART regimens. While some participants thought that the electronic pill bottle was too large to conveniently carry with them, others considered it too small for their ART regimens. These findings have important implications for the design of mobile technology for patients' use. Patients may prefer to have an opportunity to select an electronic pill bottle among several different sizes/designs or customizable electronic pill bottles, which can meet individual patient needs. Our findings highlight that mHealth technology should be designed with adequate consideration of the needs of its intended users in terms of system lights/sounds. mHealth systems in the future should offer various design options of the sizes which can be chosen depending on patients' ART regimens.

Themes related to the fit between task and technology included technical problems of task performance and functionality of the electronic pill bottle linked to the app. Failure of data transmission from the electronic pill bottle to the app was reported by our participants. Similarly, the signal transmission interruptions of the electronic pillbox were also challenging in a feasibility study conducted in Uganda.[26] A real-time medication monitoring pill bottle with recurrent inappropriate system medication reminders stemming from technical problems may be underutilized and ultimately fail to accomplish its objectives.[32] Our findings once again highlight that these technical challenges should be addressed for widespread uptake of real-time medication monitoring.

Limitations to this study include the generalizability of the results. The study predominantly included racial minorities and those who have low education levels and low annual incomes living in New York City. Results may differ in other groups, including those who have higher education levels and income. While a substantial number of underserved PLWH in the US are primary-Spanish speakers,[69,70] they were not included in this study.

6. Conclusions

This paper reported key themes related to the use of a real-time medication monitoring pill bottle linked to an HIV self-management app through an in-depth analysis of PLWH's experiences of their use in everyday lives. Tracking medication adherence and receiving push-notification medication reminders through the electronic pill bottle connected to the app encourages and supports PLWH to adhere ART medication regimens without forgetting. Findings from this work emphasize the importance of adequate consideration of the end-users' concerns/needs, such as HIV-related stigma, disclosure of HIV status and ART regimens, in regards to the customizable design of mHealth technology.

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Summary Points

- mHealth technology has the potential to be an efficacious tool in HIV self-management by improving health outcomes such as medication adherence and engagement in healthy behaviors.
- It is valuable to include intended users in the design/development of mHealth technology to support medication adherence since technology without considering users' needs will likely be misused or underutilized.
- Tracking medication adherence and receiving push-notification medication reminders through the electronic pill bottle connected to the app encourages and supports PLWH in adhering to their medication regimens.
- This paper has implications for future research designing customizable mobile health technology, including HIV-related stigma, disclosure of HIV status and antiretroviral therapy regimens for patients' use.

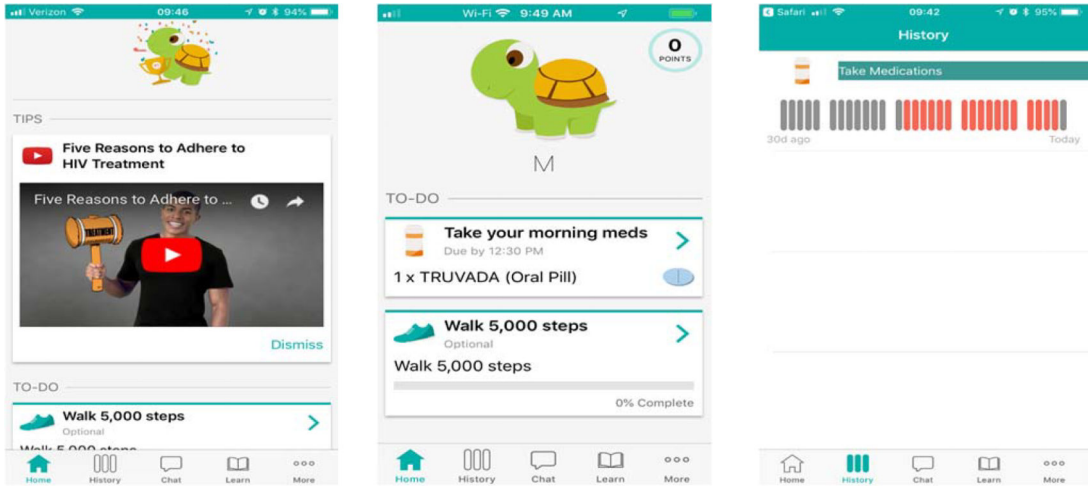

Figure 1.
Wise App features

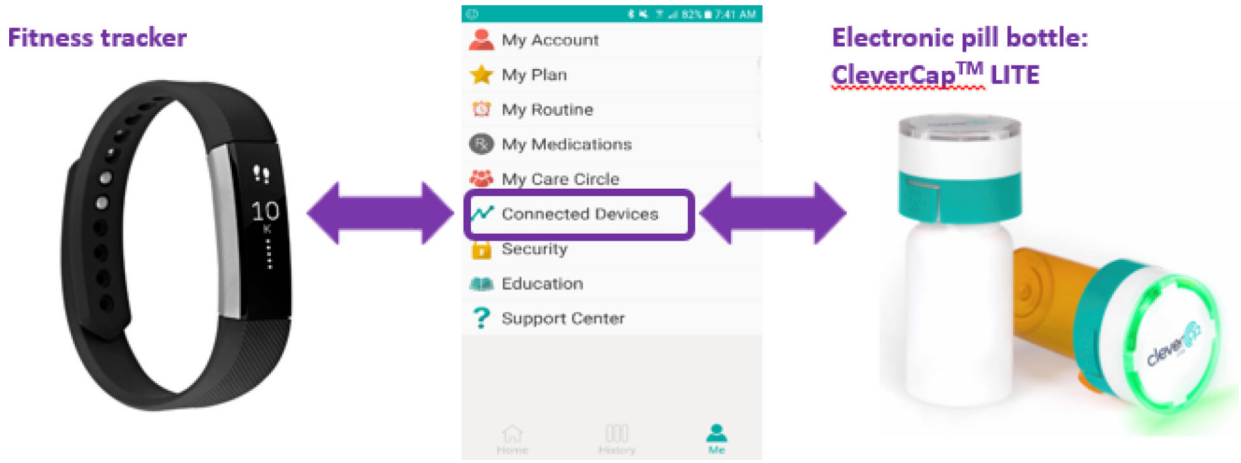

Figure 2.
Devices connected with Wise App

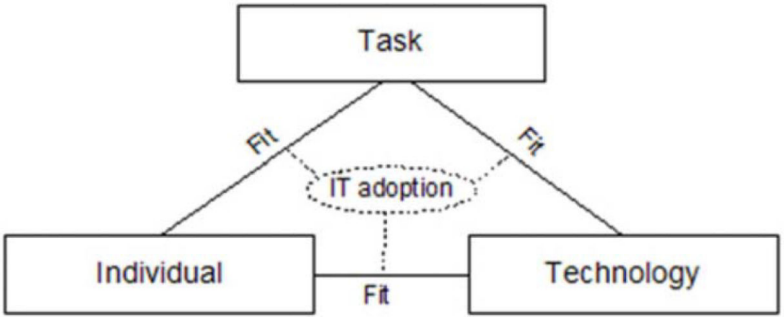

Figure 3.
Fit between Individuals, Task and Technology (FITT) framework

Table 1.

Interview guide

During the past 3 months of the electronic pill bottle use:
• Please tell me a little bit about your experience using the electronic pill bottle.
° (Probes: Where do you usually keep your pill bottle? Do you carry it with you when you travel? Where do you put it?)
• What have you used in the past for storing and receiving reminders about your medication(s)? How does this compare?
• What are some of the things that you like about using your electronic pill bottle?
• What do you dislike about the electronic pill bottle?
° (Probes: beeping and the flashing lights, connectivity, people seeing it, etc.)
• How has the electronic pill bottle changed how you take your medication(s)?
° (Probes: reminder, doesn't work, etc.)
• If a friend asked you about your experience using your electronic pill bottle, how would you describe your experience so far?
• At the completion of this study, would you want to keep using the electronic pill bottle, why or why not?

Table 2.

Characteristics of study participants (n=38)

Characteristics	n (%)
Gender	
Female	23 (60.5%)
Male	15 (39.5%)
Race	
African American	30 (79.0%)
Other	5 (13.1%)
White	3 (7.9%)
Ethnicity	
Yes, Hispanic/Latino	6 (15.8%)
No, Hispanic/Latino	32 (84.2%)
Marital Status	
Single	19 (50.0%)
In a relationship	13 (34.2%)
Legally married/domestic partnership	3 (7.9%)
Divorced	2 (5.3%)
Widowed	1 (2.6%)
Education Level	
High school diploma or equivalent	11 (29.0%)
Some high school, no diploma	12 (31.6%)
Associate or technical degree	5 (13.2%)
Some college	4 (10.5%)
Bachelor/college degree	3 (7.9%)
Professional or graduate degree	2 (5.2%)
None	1 (2.6%)
Annual Income	
Less than $10,000	19 (50.0%)
$10,000-$19,000	11 (29.0%)
Don’t Know	6 (15.8%)
$40,000-$59,000	1 (2.6%)
$60,000-$79,000	1 (2.6%)
Health Insurance Provider	
Public (e.g. Medicare, Medicaid, Ryan White)	38 (100.0%)
Private (e.g. through employer/relative’s employer)	0 (0.0%)

Table 3.

Themes and sample quotes of the FITT

FITT	
Theme	**Sample Quote**
Individual-Task Fit:	
Motivation for strict medication adherence	*This has helped me keeping track of my time, and taking it [medication] every day at the same time.*
Self-efficacy for overall health management	*It's been real helpful. I feel I can take care of my health.*
Engagement with medication reminders	*My memory is not as much as good as it was before. I really need this to help remind me to take my medication.*
Individual-Technology Fit:	
Ease of use	*It's a little easier to open than some of my regular pill bottle. I don't have to shake it to see how many is in there.*
HIV-related stigma and disclosure of HIV status	*It doesn't show what medication I am taking…because it doesn't say it on the bottle.*
Customized alert of medication time windows based on individual routine set-up	*It is a good fit with my life. I had 10 o'clock. That's what I'm aiming for….I'm trying to change that routine, and trying to at least take my pills before midnight.*
Preference for device design	*I didn't travel with it because it was very difficult to travel with. Because you would have to carry something big enough to carry the bottle, because it's very delicate.*
Task-Technology Fit:	
System functionality of data transfer from the electronic pill bottle to the app	*Once in a while, even though I've taken it, it doesn't update my phone for a couple of hours. I would be thinking that I wasn't taking my meds?*
Self-awareness of system syncing signals	*I like that it lights up, and it connects to the phone, and that the phone knows you took your meds. I can see it. I can know it right away.*