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Interest in using mobile technology to help self-manage alcohol use among persons living with HIV: A Florida Cohort cross-sectional study

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Abstract

Background—Alcohol consumption at hazardous levels is more prevalent and associated with poor health outcomes among persons living with HIV (PLWH). Although PLWH are receptive to using technology to manage health issues, it is unknown whether a cell phone app to self-manage alcohol use would be acceptable among PLWH who drink. The objectives of this study were to determine factors associated with interest in an app to self-manage drinking and to identify differences in baseline mobile technology use among PLWH by drinking level.

Methods—Our study population included 757 PLWH recruited from 2014–2016 into the Florida Cohort, an ongoing cohort study investigating the utilization of health services and HIV care outcomes among PLWH. Participants completed a questionnaire examining demographics, substance use, mobile technology use, and other health behaviors. We used multivariable logistic regression to identify factors significantly associated with interest in an app to self-manage drinking. We also determined whether mobile technology use varied by drinking level.

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AUTHOR CONTRIBUTIONS

RLC, CGEV, and MH contributed to measure development and selection. RLC, JPM, GI, and JDS contributed to participant recruitment and data collection. ZZ and JDS performed the data analysis. JDS drafted and wrote the manuscript. RLC, ZZ, CGEV, JPM, RJL, GI, MH, and CLC contributed to the revisions for the manuscript. All authors read and approved the final version of the manuscript.

Results—Of the sample, 40% of persons who drink at hazardous levels, 34% of persons who drink at non-hazardous levels, and 19% of persons who do not drink were interested in a self-management app for alcohol use. Multivariable logistic regression analysis indicated that non-hazardous drinking (AOR 1.78; CI: 1.10–2.88) and hazardous drinking (AOR 2.58; CI: 1.60–4.16) were associated with interest, controlling for age, gender, education, and drug use. Regarding mobile technology use, most of the sample reported smartphone ownership (56%), text messaging (89%), and at least one cell phone app (69%).

Conclusions—Regardless of drinking level, overall mobile technology use among PLWH was moderate, while PLWH who consumed alcohol expressed greater interest in a cell phone app to self-manage alcohol use. This indicates that many PLWH who drink would be interested in and prepared for a mobile technology-based intervention to reduce alcohol consumption.

Keywords

alcohol; drinking; HIV; self-management; mobile technology; cell phone; mobile apps; mHealth

INTRODUCTION

People living with HIV (PLWH) experience various individual and community-level barriers to initiating treatment for HIV infection and remaining in care, such as medication adherence and appointment attendance, and these barriers are further complicated by alcohol use.^{1,2} PLWH have unique risks related to alcohol use. Alcohol consumption is prevalent among PLWH, and hazardous drinking levels, defined as exceeding recommended weekly or daily alcohol consumption limits, are associated with poor health outcomes for this population.^{3,4} Furthermore, drinking at hazardous levels is generally more widespread among PLWH in comparison to persons not living with HIV.⁵ Several studies have shown that hazardous drinking is linked to adverse decision-making outcomes, such as high-risk sexual behaviors^{6,7}, illicit drug use^{3,4}, and delayed initiation of antiretroviral therapy.^{7–9} Alcohol consumption at hazardous levels is also negatively associated with CD4 counts^{3,10}, adherence to antiretroviral therapy^{3,7,8,11}, and HIV viral load suppression^{8,9}, and has been linked to premature death among PLWH.⁴

PLWH seeking to modify their alcohol consumption could benefit from flexible health interventions, such as those delivered using mobile technology.¹² Few mobile technology interventions are available to support those who want to change their drinking behavior^{13–15}, but mobile technology is emerging as a potential way to deliver effective alcohol reduction interventions.^{16–18} Studies have found PLWH have positive perceptions about using technology to help manage their HIV care and health outcomes due to perceived convenience, ease of use, and usefulness for accessing health information.^{19–23} Understanding these perceptions is important; however, it is not yet known if the average person living with HIV who also drinks has the capacity for and interest in using technology-based alcohol self-management interventions.

Very few studies have assessed mobile technology use among PLWH, but those that have found a range of usage rates for cell phones, text messaging, and other technology modalities. It has been shown that while 73% of tobacco smokers living with HIV owned a

cell phone, only 39% used text messaging.²⁴ Hu and colleagues (2014) evaluated technology use among persons who reported drinking at hazardous levels and who presented to sexually transmitted disease (STD) clinics, finding that 85% were cell phone owners and 91% used cell phone apps.²⁵ Samal et al. (2010) also found that among women presenting to an STD clinic, 93% were cell phone owners and 79% used text messaging.²² In a study on technology use among PLWH, 87% were cell phone owners with half of those owning smartphones.²⁶ Also, 81% of study participants used text messaging, whereas only 51% used cell phones to access the Internet.²⁶ Most of the data from these studies were obtained 5–10 years ago, and we seek to contribute more current knowledge to this area, especially since mobile phone ownership has been increasing each year nationally.²⁷

Apps, or software programs that run on mobile devices, such as cell phones, have been adapted for managing alcohol consumption. Some studies have evaluated user preferences regarding features of an alcohol self-management mobile app, finding users favored tracking their drinking behaviors, monitoring features, and notification services.^{28–30} No previous research, however, has specifically explored mobile technology usage and interest of PLWH to use mobile technology for alcohol-related health interventions, and, to our knowledge, our study is the first to explore this. Persons engage in a range of different drinking patterns, and it is possible that some subsets of persons who drink may be more interested in using an alcohol management app than others. To address this gap, we sought to (1) identify demographic and behavioral factors associated with interest in using a mobile app to track and manage individual alcohol use and (2) determine whether baseline mobile technology use among PLWH varied by drinking level.

METHODS

Recruitment and Ethics

Data were obtained from baseline data in the Florida Cohort study, a new NIH-supported cohort that seeks to understand the relationship between substance abuse and mental health issues, utilization of health services, and HIV care outcomes in Florida. The study initiated enrollment in 2014 and has now enrolled persons from HIV clinics at five Florida Departments of Health in Lake City, Gainesville, Tampa, Orlando, and Sanford; a foodbank affiliated with county HIV services in Fort Lauderdale, and a community health system HIV clinic in Miami. At each setting, persons with HIV were referred by clinic staff or self-referred in response to brochures available in the clinic. Any person with HIV who was 18 years of age or older was eligible to participate in the study. After providing written informed consent, participants completed an anonymous, self-administered questionnaire examining demographics, substance use, baseline mobile technology use, and interest in using potential future technologies. The survey took approximately 30–45 minutes to complete, and participants were compensated for their time in the form of \$25.00 gift cards. The research protocol was approved by the Institutional Review Boards at the University of Florida, Florida International University, and the Florida Department of Health.

Study Measures

Demographic Measures—Demographic information included age, race/ethnicity, gender, education, and homelessness status. Age was categorized into 18–34 years, 35–44 years, 45–54 years, and 55 years and older. Race/Ethnicity was categorized into Hispanic, non-Hispanic White, and non-Hispanic Black. Due to low counts (n=30), other racial groups (Native American (n=4); Asian (n=5); multi-racial (n=14); unknown (n=7)) were combined into non-Hispanic White. Gender was classified as male or female according to participant self-identification, with transgender participants assigned to their current gender preference. Education was categorized as less than a high school education, high school education or the equivalent, and greater than a high school education. Homelessness was defined as having lived in a homeless shelter, emergency shelter, car, street, or abandoned building in the past 12 months.

Substance Use Measures—Participants who never drank or did not drink in the past 12 months were categorized as persons who do not drink. Among persons who reported drinking, participants were asked to report their average frequency of drinking an alcoholic beverage (with 5 response options ranging from less than once a month to every day) and the standard number of alcoholic drinks consumed on a typical day in the past 12 months (with response options ranging from 1 to 6+). Examples of a standard drink equivalent to 12 fluid ounces of beer, 8–9 fluid ounces of malt liquor, 5 fluid ounces of wine, and 1.5 fluid ounces of hard liquor were provided. Average weekly consumption was calculated by multiplying the average number of drinks per occasion times the average frequency per week. Participants were also asked to report how often they drank 4+ standard drinks (for women) or 5+ standard drinks (for men) on one occasion and the largest number of drinks they consumed within a 24-hour period. Participants were categorized as persons who drink at hazardous levels if they self-reported drinking ≥5 drinks on one occasion (at least monthly) or >14 drinks per week for men, or ≥4 drinks on one occasion (at least monthly) or >7 drinks per week for women.³¹ Participants were categorized as persons who drink at non-hazardous levels if they self-reported any drinking but did not meet the hazardous drinking criteria.

Participants were asked to report their frequency of using marijuana, injection drugs that were not prescribed by a physician (injected heroin, injected cocaine, and injected stimulants), and 7 categories of non-injection drugs (snorted cocaine, smoked crack cocaine, snorted or smoked heroin, stimulants, pain medication, sedatives, and ecstasy). Any drug use was defined as using any of the aforementioned drugs in the past 12 months.

Mobile Technology Use Measures—To examine baseline mobile technology use, participants were asked questions about their type of cell phone, cell phone usage, and the number of apps in their cell phones. For cell phone type, participants were asked, “What is your current cell phone situation?” with the following survey responses categorized as such: “I have a smartphone” as [Smartphone], and “I have a cell phone but it is not a smartphone” and “I do not currently have a cell phone” as [No smartphone]. The survey included a picture of a home screen for a current iPhone and Android cell phone with apps to help participants distinguish a smartphone from a non-smartphone.

For cell phone usage, participants were asked questions about using cell phones for Internet access, text messaging, obtaining directions, and social media access, which were originally assessed in the survey by frequency of use, but for our analysis, cell phone usage items were dichotomized as use [Yes] or no use [No]. The following four items were asked, each with the common response options as “Never,” “Rarely,” “About once a week,” “A few times a week,” and “Daily”: (1) In the last 30 days, how often did you use the Internet with any of the following devices: My cell phone?; (2) How often do/did you do the following using a cell phone: Send or receive text messages (SMS)?; (3) How often do/did you do the following using a cell phone: Get directions or other location-based information?; (4) How often do/did you do the following using a cell phone: Check your Facebook / Twitter / Instagram or similar account? For the analysis, the responses from each of these questions were categorized as such: “Never” as [No], and “Rarely,” “About once a week,” “A few times a week,” and “Daily” as [Yes].

For number of cell phone apps owned, participants were asked, “Approximately, how many apps do you currently have in your cell phone?” with the following responses categorized as such: “None” as [None]; “1–10” and “11–25” as [1–25], and “25–50” and “> 50” as [25 or more].

Outcome Measure—To measure interest in using a self-management alcohol app, participants were asked “If available and free, how often would you use a phone app to help you track and manage alcohol and drug use behavior?” with survey response options of “Never,” “Rarely,” “About once a week,” “A few times a week”, and “Daily.” Any frequency of potential use was categorized as having interest in using an app to self-manage alcohol use, such that “Never” was categorized as [No], and “Rarely,” “About once a week”, “A few times a week”, and “Daily” were categorized as [Yes].

Statistical Analyses

To investigate demographic and behavioral factors associated with the outcome of interest, we compared sample characteristics stratified by interest in using an app to self-manage alcohol use, using two-way Pearson Chi-square tests and Fisher’s exact tests. A multivariable logistic regression analysis was conducted to assess associations between sample characteristics and interest in using an app to self-manage alcohol use. Using a cutoff of p-value <0.05, variables included in the regression model were age group, gender, education level, drinking level, and any drug use. To determine whether mobile technology use varied according to drinking level, statistics for baseline mobile technology use were compared across no drinking, non-hazardous drinking, and hazardous drinking levels, using two-way Pearson Chi-square tests and Fisher’s exact tests. All statistical analyses were performed using SAS version 9.4 (SAS Institute Inc., Cary, NC, USA).

RESULTS

Sample Characteristics

Characteristics of the study population, stratified by the outcome variable (interest in using a self-management alcohol app), are presented in Table 1. Of the total sample, 65% were

male, 41% were ages 45–54 years, 57% were African American, 34% had less than a high school education, and 18% had been homeless in the past 12 months. Most (72%) reported drinking alcohol in the past year, of whom half (36% of entire sample) met criteria for hazardous drinking. Any drug use in the past 12 months was reported by 58% of the study population.

Factors Associated with Interest in Using a Self-management Alcohol App

Participants who were younger (age group 18–34 years), Hispanic, male, had greater than a high school education, experienced homelessness, drank at hazardous levels, or used any drugs were most interested in using an app to self-manage drinking (see Table 1). Of these factors, age, gender, education attainment, drinking level, and any drug use were statistically significant ($p < 0.05$) and included in the regression model. In the multivariable regression analysis, age group 18–34 years (adjusted odds ratio (AOR): 1.74; 95% confidence interval (CI): 1.00–3.04), male gender (AOR: 1.57; CI: 1.07–2.30), greater than a high school education (AOR: 1.56; CI: 1.01–2.40), non-hazardous drinking (AOR: 1.78; CI: 1.10–2.88), and hazardous drinking (AOR: 2.58; CI: 1.60–4.16) were significantly associated with having interest in using an app to self-manage alcohol use (see Table 2).

Mobile Technology Use

Data describing baseline mobile technology use among the study population are presented in Table 3. Overall, persons who do not drink reported similar levels of mobile technology use as persons who drink at hazardous levels, with persons who drink at non-hazardous levels reporting the highest levels of use. Approximately half (52%) of persons who exhibited hazardous drinking owned a smartphone, compared to 64% of persons who exhibited non-hazardous drinking and 52% of persons who do not drink. Sixty-eight percent of persons who drink at hazardous levels used a cell phone to access the Internet, while 75% of persons who drink at non-hazardous levels and 66% of persons who do not drink reported to use this function. Among those who exhibited non-hazardous drinking, roughly three-fourths (77%) reported using a cell phone to obtain directions compared to two-thirds of persons who drink at hazardous levels (68%) and persons who do not drink (66%). Over half (56%) of persons who drink at hazardous levels reported using a cell phone to access social media, which was less than persons who exhibited non-hazardous drinking (67%) and those who do not drink (59%). The proportions of persons who drink at hazardous levels, persons who drink at non-hazardous levels, and persons who do not drink who used a cell phone for text messaging and had at least one cell phone app were relatively similar.

DISCUSSION

In this large sample of persons living with HIV infection, persons who exhibit hazardous drinking levels had the greatest interest in using a potential app to self-manage alcohol use, and persons who drink at non-hazardous levels had greater interest than those who did not drink. This was confirmed in the regression analysis, which showed that both hazardous drinking and non-hazardous drinking were associated with interest in using an app to self-manage alcohol use. Male gender, younger age, and having a high level of education attainment were also found to be associated with interest in using a self-management alcohol

app, which is consistent with findings that demonstrate higher rates of mobile technology ownership among men, younger groups of people, and those with some college education or a college degree.³² These findings indicate that an app to reduce alcohol use might be most acceptable to young males living with HIV, which is important since young men are a demographic most impacted by HIV in the United States.³³

Not only were 40% of persons who reported hazardous drinking levels and 34% of persons reporting non-hazardous drinking levels interested in using a drinking self-management app, nearly 20% of persons who do not drink also reported interest. It is interesting that a group with no self-reported drinking behavior would be interested in using a potential app developed for those who consume alcohol. It is possible these persons might be in recovery, might be interested in using such an app to help a loved one or friend, or could be interested in using apps that are more specific to drug use. Possibly, a small proportion of interested persons who do not drink could have misunderstood the question about interest in using an app to track and manage alcohol use.

Regarding the capacity for mobile technology-based interventions, we found a moderate baseline level of mobile technology usage among our study population of PLWH, which is consistent with previous research on PLWH and persons attending STD clinics.^{22, 24–26} Regardless of level of alcohol consumption, text messaging via a cell phone was the most dominant form of mobile technology use. This finding suggests interventions based in text messaging may have the most extensive reach among PLWH irrespective of drinking level. Other than text messaging, the entire study population exhibited high use of cell phones to access the Internet and obtain directions. Our study population also had high rates of owning mobile apps, which could present the opportunity to conduct mobile app-based health interventions. Also, persons who drink at hazardous levels, non-hazardous levels, and no levels of drinking alike demonstrated levels of smartphone ownership and accessing social media via a cell phone that were below many of the other mobile technology modalities.

Limitations

Limitations of this study should be considered. First, our study was based on a cross-sectional design, inhibiting us from drawing causal conclusions between demographic characteristics, mobile technology use, and interest in using an app to self-manage alcohol use. Second, self-reported data can include some biases if any participants exhibited recall bias or answered some questions dishonestly due to social desirability bias. Third, the variable for any drug use excluded prescribed medications for injection drug use but not for non-injection drug use. Thus, participants reporting drug use could have included using non-injection drugs that were prescribed by a physician. Fourth, the definition of smartphone is not validated, and some persons could have different perceptions or interpretations of what a smartphone is. Thus, participants were shown images of home screens for iPhone and Android cell phones so that the definition of smartphone would be visually understood. Fifth, our findings may not be generalizable to other places since the study participants were only recruited from public health clinics and settings in Florida. Finally, since the outcome measure mentioned a mobile app for both alcohol and drug use in the study questionnaire, we were not able to distinguish whether PLWH who drink solely wanted an app to manage

drinking, to manage drug use, or both. To account for this and accurately examine the relationship between alcohol use and interest in using an app to self-manage drinking, we controlled for drug use in the regression model.

Conclusions

In this sample of persons living with HIV, hazardous drinking, non-hazardous drinking, being male, being ages 18–34 years, and having greater than a high school education were significantly and positively associated with having interest in using an app to self-manage alcohol consumption. Our study population of PLWH who drink were fairly willing to use a cell phone app to manage alcohol use and demonstrated a moderate to high level of baseline mobile technology use, depending on the functionality. Overall, our study findings indicate that a portion of PLWH who drink have the technological capacity and interest in alcohol interventions using their personal mobile technology. Given the prevalent use of text messaging among the entire study population, any intervention that plans to incorporate mobile technology today would maximize its potential acceptability by including texting as an option, but mobile technology ownership is evolving so quickly that smartphone apps should be considered as a focus in future interventions.³⁴ Future research should explore what features and preferences that PLWH who have hazardous drinking patterns would find acceptable in mobile technology-based interventions aimed at helping them self-manage their alcohol use behavior.

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Table 1

Demographic and behavioral characteristics of persons living with HIV stratified by interest in using a cell phone app to track and manage alcohol use (The Florida Cohort, 2014–2016; N = 757).

Characteristic	Total n = 757 (%)	Not interested n = 503 (%)	Interested n = 230 (%)	P-value
Age Group^a				0.0441
18–34	135 (18)	82 (61)	53 (39)	
35–44	147 (20)	98 (67)	49 (33)	
45–54	297 (41)	206 (69)	91 (31)	
55	154 (21)	117 (76)	37 (24)	
Race/Ethnicity				0.1959
Hispanic	112 (15)	69 (62)	43 (38)	
Non-Hispanic White	207 (28)	142 (69)	65 (31)	
Non-Hispanic Black	414 (57)	292 (71)	122 (30)	
Gender^b				0.0005
Male	475 (65)	305 (64)	170 (36)	
Female	258 (35)	198 (77)	60 (23)	
Education^a				0.0493
<High school	247 (34)	182 (74)	65 (26)	
High school	235 (32)	161 (69)	74 (32)	
>High school	249 (34)	158 (64)	91 (37)	
Homeless				0.1762
No	595 (82)	413 (69)	182 (31)	
Yes	128 (18)	81 (63)	47 (37)	
Drinking Level^b				<0.0001
No drinking	197 (28)	160 (81)	37 (19)	
Non-hazardous drinking	250 (36)	165 (66)	85 (34)	
Hazardous drinking	250 (36)	150 (60)	100 (40)	
Any Drug Use^b				0.0026
No	281 (42)	207 (74)	74 (26)	
Yes	385 (58)	241 (63)	144 (37)	

Data are n (%), unless otherwise indicated.

^a $P < 0.05$

^b $P < 0.01$

Table 2

Factors associated with interest in using a cell phone app to track and manage alcohol use among persons with HIV infection: multivariable logistic regression analysis (The Florida Cohort, 2014–2016; N = 757).

Factor	Interest in a cell phone app to manage alcohol use
Age Group (years)	
18–34	1.74 (1.00–3.04, 0.0494)
35–44	1.66 (0.95–2.89, 0.0738)
45–54	1.47 (0.90–2.42, 0.1247)
55	Ref
Gender	
Female	Ref
Male	1.57 (1.07–2.30, 0.0208)
Education	
<High school	Ref
High school or equivalent	1.36 (0.88–2.10, 0.1678)
>High school	1.56 (1.01–2.40, 0.0446)
Drinking Level	
No drinking	Ref
Non-hazardous drinking	1.78 (1.10–2.88, 0.0187)
Hazardous drinking	2.58 (1.60–4.16, 0.0001)
Any Drug Use	
No	Ref
Yes	1.34 (0.93–1.92, 0.1128)

Data are adjusted odds ratios (95% confidence interval, p-value), unless otherwise indicated.

Table 3

Mobile technology use among persons living with HIV stratified by alcohol drinking level (The Florida Cohort, 2014–2016; N = 757).

Mobile technology use	Total n = 757 (%)	No drinking n = 197 (%)	Non-hazardous drinking n = 250 (%)	Hazardous drinking n = 250 (%)	P-value
Cell phone type^a					0.0153
No smartphone	302 (44)	95 (48)	91 (36)	116 (48)	
Smartphone	390 (56)	103 (52)	159 (64)	128 (52)	
Use cell phone for Internet access					0.0638
No	213 (30)	68 (34)	63 (25)	82 (32)	
Yes	492 (70)	130 (66)	190 (75)	172 (68)	
Use cell phone for text messaging					0.5415
No	73 (11)	24 (14)	24 (10)	25 (11)	
Yes	563 (89)	152 (86)	212 (90)	199 (89)	
Use cell phone for getting directions^a					0.0216
No	186 (29)	61 (34)	54 (23)	71 (32)	
Yes	450 (71)	116 (66)	182 (77)	152 (68)	
Use cell phone for social media access^a					0.0381
No	247 (39)	72 (41)	77 (33)	98 (44)	
Yes	389 (61)	105 (59)	159 (67)	125 (56)	
Number of apps in cell phone					0.6579
None	189 (30)	55 (32)	65 (28)	69 (32)	
1–25	338 (54)	95 (56)	127 (55)	116 (53)	
25 or more	95 (15)	21 (12)	40 (17)	34 (16)	

Data are n (%), unless otherwise indicated.

^a $P < 0.05$