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iPhone Apps for Smoking Cessation
A Content Analysis

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Background: With the proliferation of smartphones such as the iPhone, mobile phones are being used in novel ways to promote smoking cessation.

Purpose: This study set out to examine the content of the 47 iPhone applications (apps) for smoking cessation that were distributed through the online iTunes store, as of June 24, 2009.

Methods: Each app was independently coded by two reviewers for its (1) approach to smoking cessation and (2) adherence to the U.S. Public Health Service's 2008 Clinical Practice Guidelines for Treating Tobacco Use and Dependence. Each app was also coded for its (3) frequency of downloads.

Results: Apps identified for smoking cessation were found to have low levels of adherence to key guidelines in the index. Few, if any, apps recommended or linked the user to proven treatments such as pharmacotherapy, counseling, and/or a quitline.

Conclusions: iPhone apps for smoking cessation rarely adhere to established guidelines for smoking cessation. It is recommended that current apps be revised and future apps be developed around evidence-based practices for smoking cessation.
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Introduction

Mobile phones have shown some promise in helping people quit smoking and modifying other health behaviors.[1–4] Most of these phone-based interventions have relied on the text-messaging feature of mobile phones and consisted of a series of short, and sometimes interactive set of text messages that guide a person through the process of behavior change.

However, with the proliferation of smartphones, there are new possibilities for using mobile phones as tools for health promotion. Smartphones have powerful operating systems that can run computer programs or applications (apps), in addition to the standard features of mobile phones.[5,6] Among smartphones, the iPhone is notable because since its release in 2007, third parties have been able to create apps for the iPhone operating system and distribute them to the public through a common online website, the Apple iTunes store. To date, the Apple iTunes store has released more than 100,000 iPhone apps, which have been downloaded by consumers more than 3 billion times.[7,8] Of the applications that have been released, 20 have previously been identified as smoking-cessation apps.[9]

Few studies have examined the content quality of iPhone apps for a given health behavior or condition. The present study examines the content of existing iPhone apps as they apply to smoking cessation. Of interest is the degree to which these apps adhere to established best practices in smoking cessation, their popularity among iPhone users, and the relationship between these variables.

Methods

A list of applications was collected on June 24, 2009, using the Power Search function of iTunes version 8.1, available for download at www.apple.com/itunes. The search was restricted to apps compatible with the iPhone. The phrases *quit smoking, stop smoking,* and *smoking cessation* were used as search queries.[10] The search initially identified 62 unique apps. Apps that included a basic and deluxe version were counted as separate apps in the event that they might differ in their smoking-cessation attributes. Of the 62 apps, ten were excluded because their description in the iTunes

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store indicated they were irrelevant for reducing or quitting smoking (e.g., an app about preparing barbequed foods that was retrieved with "quit smoking"); four were eventually removed from the sample because they were no longer in the iTunes store at the time of downloading; one app was removed because the basic and deluxe versions proved to be identical. The final sample consisted of 47 apps, which were downloaded to an iPhone and analyzed.

Each app was coded for its primary approach to smoking cessation, based on categories identified by the National Tobacco Cessation Collaborative.[9] Apps were categorized into (1) "calculators" that generally tracked dollars saved and health benefits accrued over time since quitting; (2) "calendars" that generally tracked days until and after the quit date; (3) "hypnosis" that used hypnosis techniques for smoking cessation; (4) "rationing" that limited the numbers of cigarettes and/or the time in which cigarettes could be smoked; or (5) "other" for apps that did not primarily fit into one of these categories or used multiple categories. Each app was independently categorized by two coders, with no disagreement between coders.

Apps were also coded for their level of adherence to the U.S. Public Health Service's 2008 Clinical Practice Guideline for Treating Tobacco Use and Dependence.[11] To measure adherence to the Clinical Practice Guidelines, an index of 20 items was developed; these items were adapted from an index created by Bock et al.[12] Although guidelines developed for a clinical setting may not be appropriate for a mobile-phone app, the Clinical Practice Guidelines were used because they are a leading set of guidelines and have been successfully applied in the past to computer-mediated smoking-cessation programs.[12] Further, given the newness of apps on mobile phones, no other mobile-specific set of guidelines exist.

See related Commentary by Backinger and Augustson in this issue.

The items included in the adherence index are shown on the left side of Table 2. Each app was independently coded by two reviewers on each of the 20 guidelines using a scale that ranged from 0 to 3. A 3 indicated that the feature was fully present, and a 0 indicated that it was not present at all. For example, for the guideline to "recommend the use of approved medications," apps that did not mention any approved medications received a score of 0, whereas apps that made a weak recommendation for approved medications received a score of 1, a clear recommendation received a score of 2, and a clear and strong recommendation received a score of 3. The two coders were found to be in agreement 86.6% of the time. Where coding scores differed by 1 point (9.9%), the two scores were averaged. Where coding scores differed by 2 or more points (3.5%), a third reviewer was used to resolve differences. The maximum possible score on the index was 60 for each app.

Popularity was measured by looking at the frequency of downloads of each app on July 23, 2009. Information about downloads was obtained from the iTunes store using the iTunes basic search function. For a given search term, this search function lists apps by name and provides information about each app, including "Popularity," a measure of downloads since the app was released, which is depicted with vertical bars. Because of the design of this search function, searches can be obtained for only one term at a time (e.g., *quit smoking*) and information is provided on only the *relative* downloads of apps within a given search term, that is, on how much a given app is downloaded relative to the other apps retrieved by the same search term. (Information on the actual number of downloads for apps is not available). Levels of downloads are updated daily with information from the previous day's downloads (iTunes Store Customer Support, Apple, personal communication, March 3, 2010).

A search was conducted for the term *quit smoking*, which had originally retrieved the highest number of apps. This search identified 52 total apps, of which 30 were part of the original sample. A count was made of the vertical bars under the "Popularity" header associated with each of the apps in the sample. These values, which ranged from 1 to 36, served as the measure of download frequency for the apps in the current sample.

Results

The characteristics of the 47 smoking-cessation apps included in the analysis are presented in Table 1. The mean adherence index score for all apps in the sample was 7.8, and adherence scores ranged from 0 to 30 of a total of 60 points. The mean price for an app was $1.82, and prices ranged from free to $9.99. Most apps used a calculator approach (31.9%), followed by a calendar (27.7%), rationing (10.6%), hypnosis (6.4%), and other (23.4%) approach. Of the apps that were categorized as using an "other" approach ($n=11$), apps tracked the number of cigarettes smoked daily ($n=3$); provided virtual cigarettes on the iPhone as a substitute for real ones ($n=2$); used visualization techniques to remove the pleasant associations of smoking ($n=2$); provided a way to connect to support for quitting ($n=1$); and provided a mix of various approaches ($n=3$). All deluxe versions of apps were found to have the same total adherence score as the basic versions ($n=8$), although the deluxe versions offered additional features and cost more.

To understand which guidelines were strongly followed across apps, an analysis was conducted where only apps that earned adherence scores of 2 or higher for a particular guideline—indicating the feature was "mostly" or "fully" present—were included (see Table 2). This analysis indicates that on average, only 11.3% (SD=13.6) of apps strongly followed a given guideline, and that of app types, calculator apps were most successful in adhering to the guidelines whereas calendar apps were least successful. None of the apps were found to have strongly followed the guidelines to ask users for their tobacco use status, assess their willingness to quit, arrange for a follow-up, recommend the use of approved medications, and recommend the use of counseling and medication to quit smoking. Also noteworthy was that only 4.3% of apps strongly followed the guideline to connect a user with a Quitline and only 8.5% of apps made use of intratreatment social support. On the other end of the spectrum, one in four apps strongly followed the guideline to

Table 1. Characteristics of smoking-cessation apps, rank-ordered by adherence index score

App name	App type	Adherence index score (0 to 60)	Price ($)	Frequency of downloads (1 to 36)
Quit Smoking—Cold Turkey	Calculator	30	4.99	1
Quit Smoking—Cold Turkey (Lite Version)	Calculator	30	0.99	4
iGuides—Stop Smoking, Now!	Other	29.5	1.99	1
My Stop Smoking Coach with Allen Carr	Other	23	4.99	6
iDontSmoke	Calculator	20	0.99	1
iQuit—Stop Smoking Counter	Calculator	19	2.99	—
Smokeless	Rationing	19	1.99	2
Stop Smoking and Stay Quit with My Last Cigarette	Calculator	17	0.99	—
Quit Smoking Now with Max Kirsten	Hypnosis	15.5	7.99	10
Quit it (Smoking)	Calculator	14.5	0.99	—
My QuitLine	Other	13	Free	1
Quit Smoking with Andrew Johnson	Hypnosis	11	2.99	1
iQuit	Rationing	11	0.99	2
Custom Hypnosis PLUS	Hypnosis	10.5	1.99	26
CIGGY: The ill-fated terribly doomed love affair. Part 1 of 12.	Other	10	Free	1
SmokingClock	Rationing	8.5	9.99	1
StopSmoking	Calculator	8.5	0.99	—
Smoker	Calculator	8	1.99	1
Quit Smoking Helper	Calculator	7.5	0.99	1
Electric Smoke	Other	7	1.99	36
Quitter	Calculator	6	Free	1
iSmoke Break—Track your cigarette intake to help you quit smoking	Rationing	5	0.99	2
Cigarettes	Calculator	4	0.99	—
Cigarettes Lite	Calculator	4	—	—
CigaretteTracker	Calculator	4	0.99	1
Smoke Rings	Other	4	0.99	1
Smoking Pack Year Calculator	Calculator	4	0.99	1
SensoSmoke 01	Other	3	1.99	1
SensoSmoke 02	Other	3	1.99	—
Smoke Count	Other	3	0.99	—
Gooey Goals Tracker	Calendar	2.5	4.99	—
iQuit It	Calendar	2.5	0.99	—
Lung Age Calculator	Calculator	2	0.99	—
Goalkeep	Calendar	1.5	3.99	—
Big Day—Event Countdown	Calendar	1	0.99	14

(continued on next page)

Table 1. Characteristics of smoking-cessation apps, rank-ordered by adherence index score *(continued)*

App name	App type	Adherence index score (0 to 60)	Price ($)	Frequency of downloads (1 to 36)
Big Day Lite—Event Countdown	Calendar	1	Free	5
Timer (days, hours, minutes, seconds until/after events)	Calendar	1	Free	2
Days Until	Calendar	0.5	Free	26
Don't Break the Chain!	Calendar	0.5	Free	—
Don't Break the Chain! PREMIUM	Calendar	0.5	4.99	—
Bad Habit Tracker	Other	0	0.99	—
Daily	Other	0	0.99	—
Daily Tracker: Track Life	Calendar	0	1.99	20
Day Count	Calendar	0	0.99	3
Days	Calendar	0	1.99	1
iLog It	Rationing	0	Free	—
TimeJot: a time log/journal	Calendar	0	0.99	7
M (SD) across apps		7.8 (8.5)	1.8 (2.1)	3.8 (7.8)

enhance motivation by discussing the rewards associated with quitting, often by presenting personalized information on the health benefits and money saved associated with quitting (see Figure 1 for an example).

In addition to adherence to recommended practices, of interest was the popularity of smoking-cessation apps, as measured by the relative frequency of app downloads associated with the search term *quit smoking* ($n=30$). Of apps in the current sample, the top five downloaded apps in rank order were: Electric Smoke, Custom Hypnosis PLUS, Days Until, Daily Tracker: Track Life, and Big Day Event Countdown. These five apps—which were largely calendar (60%) and hypnosis (20%) apps—accounted for 67.8% of downloads in the sample. Overall, a slight negative correlation was observed whereby apps that were more frequently downloaded were less likely to be adherent ($R=-0.20$, $p<0.05$).

Because four of these five apps were not designed specifically to help someone quit smoking, and therefore could have been downloaded by users for modifying behaviors or achieving goals other than smoking cessation (e.g., weight loss), the analysis was further restricted to apps that were specific to quitting smoking, as indicated by a score of 2 or higher on this item in the index. From this restricted analysis ($n=20$ apps), the top downloaded smoking-cessation apps in rank order were Custom Hypnosis PLUS, Quit Smoking Now with Max Kirsten, My Stop Smoking Coach with Allen Carr, and Quit Smoking—Cold Turkey (Lite Version). These apps accounted for three fourths of downloads of apps that were specific to quitting smoking in the current sample. The top two apps, which were both hypnosis apps—Custom Hypnosis PLUS and Quit Smoking Now with Max Kirsten—accounted for more than half (55.4%) of downloads. These apps consisted of audio recordings (20–45 minutes long) of a hypnotherapist talking about relaxing and quitting smoking while soothing music was played in the background.

Discussion

iPhone apps for smoking cessation available in mid-2009 had low levels of adherence to proven strategies for smoking cessation. Hypnosis and calendar apps that tracked days until and after user's quit date dominated what users chose to download, and apps that were more frequently downloaded had the lowest adherence scores.

Few apps referred the user to a recommended treatment, and none strongly endorsed the use of approved medications or the combination of counseling and medication. Apps largely did not connect users to anything outside of the app, like a quitline or clinic, or provide opportunities to reach out to friends and family for social support. These omissions represent serious weaknesses of existing apps for smoking cessation. Given current consumer demand for apps for a wide range of purposes,[13] these weaknesses should be recognized as both a missed opportunity to provide iPhone users with evidence-based smoking-cessation aids and as

Table 2. Percentage of apps (and numbers of apps) exhibiting strong adherence to guidelines, rank-ordered by guideline

Guideline	All apps (*n*=47)	Calculator (*n*=15)	Calendar (*n*=13)	Hypnosis (*n*=3)	Rationing (*n*=5)	Other (*n*=11)
Specific to smoking	59.6 (28)	93.3 (14)	0.0 (0)	100.0 (3)	80.0 (4)	63.6 (7)
Enhance motivation: rewards	25.5 (12)	40 (6)	0.0 (0)	66.7 (2)	20.0 (1)	27.3 (3)
Enhance motivation: personally relevant	19.1 (9)	40 (6)	0.0 (0)	0.0 (0)	40.0 (2)	9.1 (1)
Advise every user to quit: personalized	19.1 (9)	46.7 (7)	0.0 (0)	0.0 (0)	20.0 (1)	9.1 (1)
Advise every user to quit: overall	14.9 (7)	20 (3)	0.0 (0)	0.0 (0)	20.0 (1)	27.3 (3)
Enhance motivation: risks	14.9 (7)	33.3 (5)	0.0 (0)	33.3 (1)	0.0 (0)	9.1 (1)
Assist with a quit plan: supplementary information	12.8 (6)	33.3 (5)	0.0 (0)	0.0 (0)	0.0 (0)	9.1 (1)
Enhance motivation: roadblocks	12.8 (6)	13.3 (2)	0.0 (0)	33.3 (1)	0.0 (0)	27.3 (3)
Assist with a quit plan: overall	8.5 (4)	0.0 (0)	0.0 (0)	0.0 (0)	60.0 (3)	9.1 (1)
Assist with a quit plan: practical counseling	8.5 (4)	13.3 (2)	0.0 (0)	0.0 (0)	0.0 (0)	18.2 (2)
Assist with a quit plan: intra-treatment social support	8.5 (4)	0.0 (0)	7.7 (1)	0.0 (0)	40.0 (2)	9.1 (1)
Advise every user to quit: clear	6.4 (3)	13.3 (2)	0.0 (0)	0.0 (0)	0.0 (0)	9.1 (1)
Advise every user to quit: strong	6.4 (3)	13.3 (2)	0.0 (0)	0.0 (0)	0.0 (0)	9.1 (1)
Refer to recommended treatment	6.4 (3)	13.3 (2)	0.0 (0)	0.0 (0)	0.0 (0)	9.1 (1)
Connect to a quitline	4.3 (2)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	18.2 (2)
Assess willingness to quit	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)
Assist with a quit plan: recommend approved medicines	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)
Arrange for follow-up	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)
Recommend counseling and medicines	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)
Ask for tobacco use status	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)
Mean adherence to a guideline (SD)	11.3 (13.6)	18.7 (23.7)	0.4 (1.7)	11.7 (27.1)	14.0 (23.5)	13.2 (14.9)

Note: This analysis is limited to apps that earned adherence scores of ≥2 for a particular guideline, indicating the feature was *mostly* (=2) or *fully* present (=3).

a setback for the promotion of evidence-based smoking-cessation methods.[11,14,15]

The finding that apps that were downloaded more frequently had lower scores on the total adherence index is disappointing, but not surprising. Indeed, more than half of downloads for the smoking-specific apps associated with the term *quit smoking* in the current sample were found to be for hypnosis apps, a finding that is consistent with other literature on what consumers seek out for smoking cessation.[16,17]

In considering the value of iPhone apps for smoking cessation, it is noteworthy that currently iPhones or more broadly speaking smartphones have limited reach, especially among smokers. Smartphones make up 25% of the U.S. mobile phone market, one quarter of which consists of iPhone users.[18] Further, iPhone users are a privileged group, with 49% having a college education and 67% earning more than $70,000 a year.[19] Given the demographics of smokers,[20] it can be assumed that among iPhone users, smoking prevalence is low. However, iPhone purchases are rising among those with lower SES where smoking prevalence is higher, as consumers opt for a single mobile device for communications, Internet access, and entertainment in lieu of multiple devices.[21] As smartphones reach a broader segment of the U.S. population, the reach and potential utility of iPhone apps for smoking cessation will grow.

The strength of the present study is that it represents the first to examine systematically the content of iPhone apps for improving health behaviors such as smoking cessation. In an era where the prevalence of smartphones and their associated apps have exploded,[13,18] it is important to explore the applications of these devices in promoting the public's health, which includes promoting health behaviors such as smoking cessation.[5]

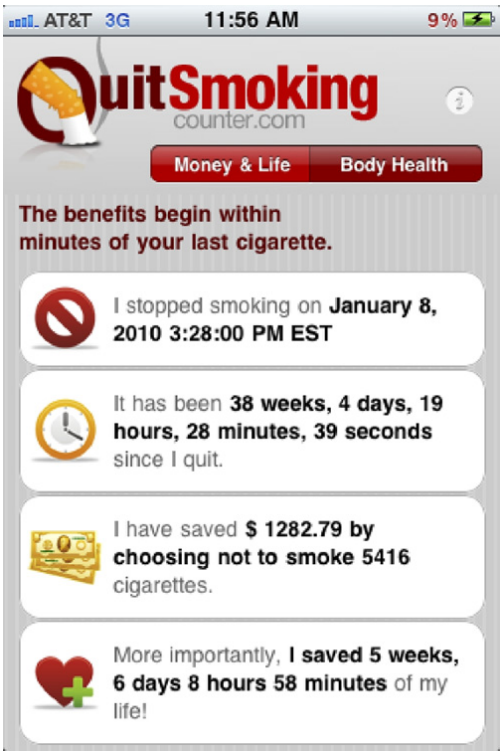

Figure 1. iQuit—Stop Smoking Counter: example of a calculator app that provided the user with a personalized readout on health and monetary savings based on an entered quit date and quantity of cigarettes smoked per day

The weaknesses of the current study include that the analysis is limited to attributes of iPhone apps based on the adherence index. Not all claims made within the apps were analyzed for accuracy, and the apps were not analyzed for their usability (or ease of use) with consumers. Additionally, because of the nature of search options in the iTunes search, it was not possible to get the download frequency data for all apps that were part of the current sample.

Because the current search was limited to apps that came up for the term *quit smoking* and omitted search results for *stop smoking* and *smoking cessation*, the current frequency data may be biased toward populations who more commonly use this term.[10] Also because of limitations in the iTunes search, it was not possible to get an absolute sense of the numbers of downloads for smoking-cessation apps. Finally, the scope of the analysis was limited to iPhone apps in the iTunes Store at the time of the analysis, a limitation because apps are frequently added to and removed from the iTunes Store.

Text-messaging on mobile phones has already shown some promise in helping people quit smoking and modify other health behaviors.[1–4] The iPhone and other smartphones offer the possibility of supplementing text message–based interventions with computer programs that can weave together expert systems, games, multimedia (e.g., music, video), and the Internet (e.g., e-mail, social networking sites).

Although this content analysis reveals that currently available apps have low levels of adherence to key guidelines from the US Public Health Service's 2008 Clinical Practice Guidelines, future apps may nonetheless serve as powerful tools in smoking cessation. It is therefore recommended that new apps be developed and existing apps be revised around evidence-based principles, and that these apps undergo rigorous evaluations. Through such a process, we can build our understanding of how smartphones can be effective in helping people quit smoking.

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