A Content Analysis of Popular Smartphone Apps for Smoking Cessation

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Background: Smartphone applications (apps) are increasingly available for smoking cessation.

Purpose: This study examined the content of popular apps for smoking cessation for both iPhone and Android operating systems in February 2012.

Methods: A total of 252 smoking-cessation apps were identified for the iPhone and 148 for the Android. Across both operating systems, the most popular apps were identified (n=47 for the iPhone and n=51 for the Android) and analyzed for their (1) approach to smoking cessation and (2) adherence to an index based on the U.S. Public Health Service's Clinical Practice Guidelines for Treating Tobacco Use and Dependence. Where available, apps were coded for frequency of downloads. The analysis took place in 2012.

Results: Overall, popular apps have low levels of adherence, with an average score of 12.9 of a possible 42 on the Adherence Index. No apps recommended calling a quitline, and only a handful of apps recommended using approved medications (4.1%). Android apps in the sample were downloaded worldwide between 310,800 and 1,248,000 times per month. For both the iPhone and Android, user ratings were positively associated with scores on the Adherence Index. For the iPhone, display order was also positively associated with scores on the Adherence Index.

Conclusions: Apps could be improved by better integration with the Clinical Practice Guidelines and other evidence-based practices.

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Introduction

Based on the prevalence of smartphone ownership[1] and smoking[2], and an estimated 11 million smokers in the U.S. own a smartphone. The extent to which smoking-cessation apps are being used on smartphones, and to what effect, is unknown. No studies to date in the peer-reviewed literature have reported on the efficacy of smartphone apps for smoking cessation. Moreover, a content analysis of 47 iPhone apps for smoking cessation indicated that apps have low levels of adherence to key evidence-based practices.[3]

A number of trends have emerged that have made an updated review of apps warranted. Android has overtaken iPhone and its operating system as the leading smartphone operating system.[4] Additionally, the number of available smoking-cessation apps on both platforms has increased substantially. Finally, the evidence base to support using mobile phones for smoking cessation, specifically text-messaging programs, has grown,[5,6] with two meta-analyses supporting the use of text-messaging programs.[5,7]

This study set out to update the previous study[3] by expanding the scope of review to include apps for both the iPhone and Android and by expanding the evaluation criteria to reflect the current evidence base. Of interest is the degree to which popular smoking-cessation apps adhere to established best practices for smoking cessation and the extent to which these apps are being used by the public.

Methods

Sample

A list of smartphone apps was collected for both the iPhone and Android, the two leading smartphone operating systems,[4] on February 11, 2012, using the search terms *quit smoking*, *stop smoking*, and *smoking cessation*. The list of possible apps for the iPhone was obtained using iTunes (version 10.5.2) and for the

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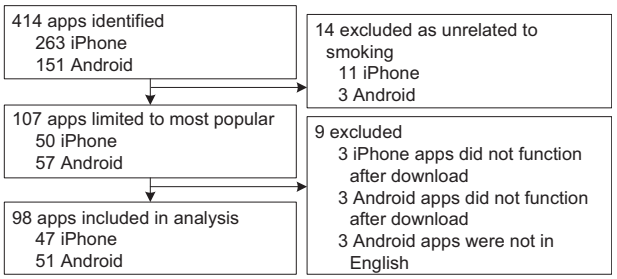

Figure 1. Procedure for selection of sample of smoking-cessation apps

Android, using Google Play. A total of 414 quit-smoking apps were identified. Because the volume of apps exceeded available resources, a decision was made to limit the analysis to the top 50 most popular English-language apps for each operating system. The final sample consisted of 47 apps for the iPhone and 51 for the Android for a total of 98 apps (Figure 1 provides an overview of sample selection procedures).

The measure of popularity used to define the sample varied across operating systems. For the Android, total worldwide app downloads were used as a proxy for popularity. Total app downloads were available in Google Play for each app starting on November 27, 2011,[8] and are available in ranges (e.g., 1000–5000). Because it was not possible to rank Android apps within the same range of downloads, all apps that were downloaded at least 1000–5000 times were selected (n=57) in order to obtain a sample of approximately 50 apps. The final Android app sample (n=51) represents 98.0% of the downloads of all identified Android quit-smoking apps (n=148).

Unlike Google Play, the iTunes App Store does not provide information on app downloads. Instead, the display order of search results on the computer monitor was used as the indicator of popularity, and the first 50 displayed apps were selected. Although display order is primarily a function of downloads, "other undisclosed factors related to popularity" are included in its calculation (Apple Inc. Customer Support, January 2012).

Users' ratings of apps were recorded as a secondary measure of popularity. In both Google Play and the iTunes App Store, consumers who have downloaded an app can rate apps on a 5-point scale, with 1 being the lowest rating and 5 the highest. Average user ratings were recorded for each Android and iPhone app.

Coding of Apps

Apps were coded on each item in the Adherence Index (Table 1). Items were primarily derived from the U.S. Clinical Practice Guideline for Treating Tobacco Use and Dependence.[9] Two items were added to the original index[3] and one item was deleted, for a total of 21 items. One new item assessed whether an app had a texting or alert feature to reflect the current evidence base supporting the use of text messaging for smoking cessation,[5–7] the only mobile feature studied to date for smoking cessation. The other item assessed whether the app included interactive features, as effective text-messaging and other computer-mediated programs generally have been found to be interactive.[7,10,11] The deleted item assessed whether the app enhanced motivation in a way that was personalized because coders noted it as duplicative of another item that promoted personalized advice on quitting.

Each app also was coded into categories according to the primary approach it used toward smoking cessation. In addition to the four categories previously used (calculator, hypnosis, rationing, and calendar/tracker),[3] three additional categories of apps emerged. An "informational" app was one that primarily provided information on quitting smoking. A "lung health tester" app claimed to measure lung health or lung capacity by having the user blow into the microphone of their phone. A "game" app provided a game for quitting smoking. Any app that did not fall into the previous seven categories was categorized as other.

Two researchers independently coded each app on each item of the index in 2012. Each item was coded as 0 indicating "not present at all," 1 indicating "partially present," or 2 indicating "fully present." The maximum possible score on the index for an app was 42 points. The coders were found to be in agreement for the iPhone 76.3% of the time, and for the Android 84.97% of the time. Average inter-rater agreement based on Cohen's kappa was 0.77 for the Android and 0.52 for the iPhone. If coding scores differed by 1 point, the two scores were averaged. This occurred 15.8% of the time for the iPhone and 8.12% for the Android. If coding scores differed by 2 points, a third reviewer was used to resolve differences. This occurred 7.9% of the time for the iPhone and 7.1% for the Android. Statistical comparisons of means were conducted across operating systems using t-tests. Tests of associations between Index Scores and popularity were conducted with Pearson correlations.

Results

An overview of the characteristics of smoking-cessation apps (n=98) is presented in Table 1, and details about each app are provided in Appendix A (available online at www.ajpmonline.org) for the iPhone and Appendix B (available online at www.ajpmonline.org) for the Android. The average Adherence Index Score for all apps in the sample was 12.9 (SD=6.8) of a possible 42 points. Calculator apps were the most common category, representing 38.8% of all apps, followed by hypnosis apps (17.3%); rationing apps (15.3%); trackers (12.2 %); informational (6.1%); games (3.1%); lung health testers (2.0%); and other (5.1%). Of apps categorized as "other" (n=5), four aimed to alter a person's associations with smoking.

For the Android, the download range of each Android app (n=51) was summed. Results indicate that the apps were downloaded between 777,000 and 3,120,000 times worldwide over the 2.5-month period (or between 310,800 and 1,248,000 times per month). Using the midpoint of the download range, apps were downloaded approximately 779,400 times per month.

To understand which guidelines were strongly followed across apps, an analysis was conducted in which only apps that earned an average adherence score of 1.5 or higher for a particular guideline—indicating the feature was "mostly" or "fully" present—were included[3] (Table 1). This analysis indicated that, on average, 28.1% (SD=27.0) of apps strongly followed a given guideline, with no difference between operating systems. Areas of