THE ELEMENTS IN SMOKING CESSATION APPS OF IOS AND ANDROID

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ABSTRACT

Background – Millions of people were killed by the sole usage of tobacco. WHO has launched the Framework Convention on Tobacco Control to combat pandemic around the world. Nowadays, smartphone is getting a lot of attention from the citizen for the health promotion status to manage their addiction and reinforce their health behaviour. However, some apps are in existence with unverified contents and this may lead to adverse effects to the users.
Purpose – The purpose of our study is (1) to evaluate the Smoking Cessation App based on the adherence to specific guidelines and (2) to compare Android and iOS smoking cessation apps.
Methods – A total of 50 smoking cessation apps were identified for the iPhone and 50 for the Android. Each app was evaluated by four reviewers for its content adhered to the U.S. Public Health Service's Updated Clinical Practice Guidelines for Treating Tobacco Use and Dependence. Mean of adherence score was compared between these two operating systems.
Results – Majority of apps have moderate to low levels of adherence, with adherence score in the range of 0-40 (out of 60). Based on our study, T-test of equality of means gave a significant difference of 0.029 which is less than 0.05 that is significant cut off point. The mean adherence score for Android is 26.72 which is more than android with a mean adherence score of 22.20. This shows that Android apps is more superior than iOS apps.
Conclusions – Smoking cessation apps can be improved by following the U.S. Public Health Service's 2008 Clinical Practice Guidelines for Treating Tobacco Use and Dependence. Available apps should be revised and improved with the help of IT experts and healthcare professionals to create a more reliable app.

Keywords: Mobile phone apps, smoking cessation, iOS, Android.

INTRODUCTION

Tobacco use is a major preventable cause of premature death and diseases which unknowingly kills 6 million people worldwide annually. There are 600,000 of the deaths were among non-smokers who were exposed to the second-hand smoke (WHO, 2016). Smoking is continuously prevalent in many parts of the world and about 80% of 1 billion smokers are actually living in low and middle-income countries. According to WHO global report on trends in tobacco smoking 2000-2025-first edition, The Framework Convention on Tobacco Control has been launched to fight and curb the pandemic of smoking around the globe, in which MPOWER activities (Monitor tobacco used and prevention policies, Protect people from tobacco smoke, Offer help to quit tobacco, Warn concerning the danger of tobacco, Enforce ban on tobacco advertising, promotion and sponsorship, Raise taxes on tobacco) are the main elements and activities to obtain the stipulated objectives on tobacco control. In 2015, approximately 22.8% (4,991,458) of Malaysian population aged 15 years and above are being documented as smokers, 43.0 % (4.85 million) of men and 1.4% (143,566) of women smoked manufactured

cigarettes, hand-rolled and smokeless cigarettes. Out of the current smokers, 20.5% were daily smokers; 38.8% of men and 1.1% of women. The Centers for Disease Control and Prevention (CDC) reports that about 70% of smokers are willing to quit and almost 50% try each year. But only less than 10% are successful (CDC, 2011). Regarding of mass media, 69.6% of Malaysian adults had come across the information about against the cigarette in newspapers or magazines and 76.4% on televisions. It was estimated about 86 % of current smokers (86.0% of men, 84.9% of women) had encountered the warnings regarding health on cigarette packages, but only 59.5% of current smokers (59.4% of males, 62.4 % of females) thought about quitting smoking because of these messages (NHMS, 2015). Overall, 29.6% (28.8% of men, 30.4% of women) of Malaysian adults had encountered cigarette marketing via advertisements and promotions (Ministry Of Health, 2015). Many evidence-based smoking cessation methods (psychological and behavioural intervention, telephone intervention therapy and acupuncture therapy) have been implemented to assist in smoking cessation.

In recent years, smartphone app interventions have been increasingly used as platforms for health promotion including facilitating smoking cessation (Haug S, Meyer C, Schorr G, Bauer S, John U, 2009), providing diabetes education (Obermayer J, Riley W, Asif O, Jean-Mary J, 2004) and encouraging attendance of primary care appointments (Bin Dhim NF, McGeechan K, Trevena L, 2014). New information technologies are being used to assist continuous health behaviour change and the management of smoking addiction. Smartphones are obtaining major attention from nowadays people as a potential information technology. Due to easy-to-bring feature of smartphones, managing one's addiction for long term and reinforcing their health behaviours via communications and apps becomes more relevant and convenient. For smokers, stop in smoking is one of the significant changes they could make towards their behaviour as it can improvise the way of their life. A recent study found that smoking cessation apps were downloaded more than 700,000 times every month. In another study, almost half of smokers had used an app to support their quit attempt (Health Behavior News Service, 2013). It is inarguable that latest evidence has showed the advantage of smartphone in supporting smoking cessation.

In Malaysia, variety of smartphone apps for smoking cessation are being released. The problem is that apps developed by individuals are being distributed extensively and it is hard to see if these apps were actually developed based on theoretical and scientific evidence. It is possible that apps with unverified contents have the unwanted effects on the health of the respective apps users. To address this issue, about 100 apps in IOS and Android were analyzed and evaluated its contents and functions according to US Clinical Practice Guideline for Treating Tobacco Use and Dependence as a framework for analysis.

LITERATURE REVIEW

Please refer to list of references given.

AIM – The aim of our study is (1) to evaluate the Smoking Cessation App based on the adherence to specific guidelines and (2) to compare Android and iOS smoking cessation apps.

METHODOLOGY

A list of smartphone apps was collected by random sampling for both the iPhone and Android, on 16 October 2019 using the search terms quit smoking, stop smoking and smoking cessation. The list of possible apps for the iPhone was obtained using App Store and for Android using

Google Play. The sample consisted of 50 apps for the iPhone and another 50 apps for the Android for a total of 100 apps. The Android and iOS apps were evaluated by two coders each. Apps were also coded for their level of adherence to the U.S. Public Health Service's Updated Clinical Practice Guideline for Treating Tobacco Use and Dependence. 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, B.C., Graham, A.L., Sciamanna, C.N., 2004. 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 (Bock, B.C., Graham, A.L., Sciamanna, C.N., 2004). Further, given the newness of apps on mobile phones, no other mobile-specific set of guidelines exist. The four coders had a discussion on how to evaluate the apps according to the 20 guidelines.

Each app was coded for its primary approach to smoking cessation, based on categories identified by the National Tobacco Cessation Collaborative. (Abroms, L. C., Padmanabhan, N., Thaweethai, L., & Phillips, T., 2011). Apps were categorized into (1) "calendars" that generally tracked days until and after the quit date; (2) "calculators" that generally tracked dollars saved and health benefits accrued over time since quitting; (3) "hypnosis" that used hypnosis techniques for smoking cessation; (4) "statistic" that shows graph on how much of cigarettes one's took and recorded daily limited; or (5) "other" for apps that did not primarily fit into one of these categories or used multiple categories.

Each app was independently coded by two reviewers for Android and two reviewers for iOS on each of the 20 guidelines using a scale that ranged from 0 to 3. A 3 indicated that the feature was completely present and very clear, and 0 indicated that it was not present at all. For example, for the guideline to "refer to recommended treatment," apps that did not mention any recommended treatment 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 completely present and clear recommendation received a score of 3. The maximum possible score for each app was 60. Adherence score is divided into three category which are weak (0-20), moderate (21-40) and strong (41-60).

Data Analysis
The statistical analysis was performed using SPSS version 23.0 software. Total number, percentages, and mean were calculated to describe the features of apps. To compare the characteristics between two operating systems, iOS and Android, we used t tests. It is to identify if there is a significant difference between the significance means of iOS and Android. Content validity was done by the expert lecturers from Faculty of Medicine. The Content Validity Index (CVI) was 1.00. Face validity was also done which composed of three components, that are, easy to answer (97.2%), layout/appearance (97.6%) and clarity of words (95.95%)

RESULTS
Table 1 & 2 provides an overview of the characteristics of smoking cessation apps for iPhone (n=50) and Android (n=50). The mean compliance index score for iPhone app was 32.4% meanwhile for android apps was 46.3%. Others apps were the most common category in iOS, accounting for 51.26% of all apps, followed by statistic apps (33.0%); calculator apps (31.8%); hypnosis (30.0%); calendar (15.0%). In android, calculator apps were the most common category in android accounting for 50.63% of all apps, followed by calendar apps (47.78%);

statistic (46.25%); other apps (45.42%); hypnosis (41.25%). Of apps categorized as "other" in iOS and android, it is composed of rationing, coaching and planning.

To understand the guidelines were closely followed across apps, an evaluation was performed that included only apps that received an average compliance rating of 2 or higher for a specific guideline — suggesting that the feature was "mostly" or "absolute" present were included (Table 1&2). The analysis showed that an average of 32.4% of all apps in iOS followed a given guideline strongly, compare to android which is 46.3%. Smoking-specific is the strength areas for both applications (100% android & 94% iOS). On the other side, fewer than one-fifth of the android applications follow the guidelines - enhance motivation: roadblocks (18%); refer to recommended treatment (12%); connect to a quitline (4%); recommend counselling and meds (10%). Meanwhile for iOS applications, less than one fifth follow the guidelines- assist with a quit plan: practical counselling (18%); assist with a quit plan: Intra-treatment social support (18%); refer to recommended treatment (8%); connect to a quitline (2%); assess willingness to quit (10%); assist with a quit plan: recommend approved Meds (4%); recommend counselling and meds (6%). None of the apps arrange for follow up (0%) in iOS. Based on table 3, apps with higher Adherence Index scores were more likely good to be used as an app for smoking cessation. The highest app score for the iOS category is 'quitSTART' with adherence score of 46, meanwhile for the android category is 'Stop Tobacco Mobile Trainer. Quit Smoking App Free' with adherence score of 46.

In Table 4, the total of apps in iOS which categorize as weak (0-20) is 23, for moderate (21-40) is 25 and strong (41-60) is 2.On the other side, the total of apps in android which categorize as weak (0-20) is 16, for moderate (21-40) is 33 and strong (41-60) is 1. The total percentage of all apps for weak category is 39%, while moderate is 58%, and 3% for strong category.

Referring to table 5, the T-test result showed that there is a significance difference mean between iOS apps and android apps. The mean for the iOS app is 22.20, but the android apps is 26.72. Based on Table 6, the significance difference of our data analysis in T-test for Equality of Means is 0.029 which is lower than 0.05, and this showed that there is a significance between iOS and android operating system. From this, we conclude that android is more better than iOS in term of smoking apps cessation.

DISCUSSION
Principal Findings
The main objective of our analysis is to figure out what are the elements in a smoking cessation apps that makes it effective. Evidence show iPhone apps for smoking cessation available in mid - 2009 had low levels of adherence to proven strategies for smoking cessation. Other than that, we also compare between iOS and android in terms of their adherence score to the specific guidelines. Generally, our studies have found that majority of the apps have moderate adherence score (58%), followed by weak adherence score (39%) and lastly strong adherence score (3%). In the article Free smoking cessation mobile apps available in Australia: a quality review and content analysis found that majority of apps (57.1%) failed to meet the minimum acceptability score (Louise Thornton, 2017). Each app had their own strength but had not adhere to most of the basic guidelines needed in a smoking cessation app. The fact that many of these apps had moderate to low adherence score as can be expected. The most significant omissions were found to be quitline referrals and suggestion for approved medications in both iOS and android operating systems. These omissions should be highlighted and noted to improve the quality of available apps in the future.

Evidently, for android apps the category of apps that showed highest mean adherence score is the calculator category (50.63%) whereas iOS apps is the others category (51.26%). The "others" category that showed the highest adherence score comprised of coaching approach. 'quitSTART' app in iOS has the highest adherence score which is 46 while android app, 'Stop Tobacco Mobile Trainer: Quit Smoking App Free' has the highest adherence score of 46. Meanwhile based on article Content Analysis of Smartphone Apps for Smoking Cessation in China: Empirical Study (Cheng et al, 2017), it states that the 'Quit Smoking at Once app had the highest score of 38 for iOS while 'The Quit Smoking app' had the highest score for android. Statistically, the mean adherence score for android apps is 26.72 and for iOS is 22.20. Thus, android apps are shown to be better than iOS apps. In contrast, the study in article Content Analysis of Smartphone Apps for Smoking Cessation in China: Empirical Study (Cheng et al, 2017), states that the mean adherence score was 11.1 for android apps and 14.6 for iPhone apps.

In our analysis, according to the independent sample t-test for Equality of Means, the p-value is 0.029 which shows that there is a significance difference between the mean.

LIMITATIONS

There are 2 limitations in conducting our study. The first limitation is that only free apps were downloaded. Most of the free apps had built-in premium memberships that must be purchased to unlock more features in the apps. If the coders were to purchase apps or become a premium member, it is more likely to find more apps which had high adherence score. The second limitation was that the apps evaluated were only the ones that are available in 2019. Considering that the operating system are rapidly developing and updating to be better, it will be exciting to see whether the development and evolution of both operating system will lead to the betterment of apps in terms of being more evidence-based.

CONCLUSION

In conclusion, as shown in, only three percent of all Android and iOS apps had strong adherence score towards the guidelines. Other than that, Android apps have better mean adherence score to iOS. There is also a significant difference between the adherence score between Android and iOS apps . Although there are advancements of technology and increase in availability in smoking cessation apps, many of them still lack in crucial elements that can bring a person to quit smoking. It is unfortunate that the market is currently flooded with apps of moderate to low quality which can potentially prevent the best apps from being found. The exposure of less effective apps to users can give a bad impression towards the growing eHealth field by lowering a person's confidence in persisting to quit the bad habit and as a result may even make them unwilling to find other apps that may actually help them to become better.

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Table 1: Percentage of iOS Apps (and Numbers of Apps) Exhibiting Strong Adherence to Guidelines, Rank Ordered by Guideline

Guideline	All apps (n=50)	Calendar (n=3)	Calculator (n=25)	Hypnosis (n=4)	Statistic (n=5)	Others (n=13)
Specific to smoking	94 (47)	66.67 (2)	96 (24)	100 (4)	100 (5)	92.31 (12)
Enhance motivation: rewards	40 (20)	33.33 (1)	44 (11)	0 (0)	60 (3)	38.46 (5)
Enhance motivation: personally relevant	80 (40)	33.33 (1)	76 (19)	75 (3)	80 (4)	100 (3)
Advice every user to quit: personalized	38 (19)	0 (0)	28 (7)	25 (1)	60 (3)	61.54 (8)
Advice every user to quit: overall	60 (30)	0 (0)	48 (12)	75 (3)	60 (3)	92.31 (12)
Enhance motivation: risks	52 (26)	33.33 (1)	52 (13)	25 (1)	40 (2)	69.33 (9)
Assist with a quit plan: Supplementary information	48 (24)	0 (0)	40 (10)	25 (1)	40 (2)	84.62 (11)
Enhance motivation: roadblocks	30 (15)	0 (0)	32 (8)	0 (0)	20 (1)	46.15 (6)
Assist with a quit plan: overall	40 (20)	0 (0)	32 (8)	25 (1)	20 (1)	76.92 (10)
Assist with a quit plan: practical counselling	18 (9)	0 (0)	4 (1)	25 (1)	0 (0)	53.85 (7)
Assist with a quit plan: Intra-treatment social support	18 (9)	33.33 (1)	16 (4)	25 (1)	20 (1)	15.38 (2)
Advice every user to quit: clear	44 (22)	0 (0)	32 (8)	75 (3)	20 (1)	76.92 (10)
Advice every user to quit: strong	32 (16)	0 (0)	20 (5)	75 (3)	0 (0)	61.54 (8)
Refer to recommended treatment	8 (4)	0 (0)	4 (1)	0 (0)	0 (0)	23.08 (3)
Connect to a Quitline	2 (1)	0 (0)	4 (1)	0 (0)	0 (0)	0 (0)
Assess willingness to quit	10 (5)	0 (0)	8 (2)	0 (0)	20 (1)	15.38 (2)
Assist with a quit plan: Recommend approved Meds	4 (2)	0 (0)	0 (0)	0 (0)	0 (0)	15.38 (2)
Arrange for follow-up	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Recommend counselling and meds	6 (3)	0 (0)	4 (1)	0 (0)	20 (1)	9.69 (1)
Asks for tobacco use status	24 (12)	100 (3)	96 (24)	50 (2)	100 (5)	92.31 (12)
Means adherence to a guideline	32.4	15.0	31.8	30.0	33.0	51.26

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

Table 2: Percentage of Android Apps (and Numbers of Apps) Exhibiting Strong Adherence to Guidelines, Rank Ordered by Guideline

Guidelines	All apps (n=50)	Calendar (n=18)	Calculator (n=8)	Hypnosis (n=4)	Statistic (n=8)	Others (n=12)
Specific to smoking	100 (50)	100 (18)	100 (8)	100 (4)	100 (8)	100 (12)
Enhance motivation: rewards	62 (31)	66.67 (12)	37.5 (3)	25 (1)	75 (6)	75 (9)
Enhance motivation: personally relevant	66 (33)	66.67 (12)	75 (6)	75 (3)	62.5 (5)	58.33 (7)
Advice every user to quit: personalized	50 (25)	50 (9)	75 (6)	50 (2)	37.5 (3)	41.67 (5)
Advice every user to quit: overall	48 (24)	50 (9)	62.5 (5)	75 (3)	37.5 (3)	33.33 (4)
Enhance motivation: risks	76 (38)	77.78 (14)	100 (8)	25 (1)	50 (4)	91.67 (11)
Assist with a quit plan: Supplementary information	66 (33)	77.78 (14)	62.5 (5)	50 (2)	62.5 (5)	58.33 (7)
Enhance motivation: roadblocks	18 (9)	22.22 (4)	12.5 (1)	0 (0)	25 (2)	16.67 (2)
Assist with a quit plan: overall	52 (26)	61.11 (11)	37.5 (1)	50 (2)	62.5 (5)	41.67 (5)
Assist with a quit plan: practical counselling	32 (16)	33.33 (6)	37.5 (1)	25 (1)	37.5 (3)	25 (3)
Assist with a quit plan: Intra-treatment social support	30 (15)	33.33 (6)	37.5 (1)	0 (0)	50 (4)	33.33 (4)
Advice every user to quit: clear	52 (26)	50 (9)	50 (4)	75 (3)	62.5 (5)	41.67 (5)
Advice every user to quit: strong	48 (24)	50 (9)	50 (4)	75 (3)	50 (4)	33.33 (4)
Refer to recommended treatment	12 (6)	5.56 (1)	37.5 (3)	25 (1)	0 (0)	25 (3)
Connect to a Quitline	4 (2)	0 (0)	0 (0)	0 (0)	0 (0)	16.67 (2)
Assess willingness to quit	38 (19)	44.44 (8)	37.5 (3)	50 (2)	37.5 (3)	25 (3)
Assist with a quit plan: Recommend approved Meds	4 (2)	0 (0)	0 (0)	25 (1)	0 (0)	8.33 (1)
Arrange for follow-up	66 (33)	66.67 (12)	62.5 (5)	50 (2)	75 (6)	66.67 (8)
Recommend counselling and meds	10 (5)	0 (0)	37.5 (1)	25 (1)	0 (0)	25 (3)
Asks for tobacco use status	92 (46)	100 (18)	100 (8)	25 (1)	100 (8)	91.67 (11)
Means adherence to a guideline	46.3	47.78	50.63	41.25	46.25	45.42

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

Table 3: Applications name with adherence score

Application	Category	Operating System	Adherence Score
Quit that!	Calendar	1	4
No Smoking :Quit Smoking	Calendar	1	16
QuitNow!	Calendar	1	20
Quit Smoking Hypnosis	Hypnosis	1	6
Quit Smoking	Hypnosis	1	18
Quit Smoking NOW	Hypnosis	1	29
Quit Smoking	Hypnosis	1	11
CigQuit	Statistic	1	26
StopSmoke	Statistic	1	20
KicktheHabitQuit	Statistic	1	12
Kick Smoke(limited version)	Statistic	1	13
QuitGuide	Statistic	1	30
Smoke Free 28	Other	1	23
Quit Smoking 101	Other	1	41
Quit Smoking Tracker	Other	1	34
Stop Smoking	Other	1	34
Quit Smoking by Hate Smoking	Other	1	24
Craving to Quit	Other	1	39
QuitGenius	Other	1	24
3-2-1 Quit Smoking Now!	Other	1	27
Stop Tobacco	Other	1	37
Allen Carr's Easyway To Stop Smoking	Other	1	30
SmokerFace	Other	1	18
quitSTART	Other	1	46
Puff Away! Stop Smoking Today	Other	1	38
MyQuitCoach	Calculator	1	16
Since IQuit	Calculator	1	7
Last Smoking	Calculator	1	10
Quit For Health	Calculator	1	21
NoMoreSmoking	Calculator	1	14
Kwit	Calculator	1	15
QuitSmoking App	Calculator	1	39
Quitcy	Calculator	1	34
I Don't Smoke	Calculator	1	30
Smokenote	Calculator	1	13
No Smoking Calculator	Calculator	1	23
Quit Smoking	Calculator	1	10
Quit Smoking Buddy	Calculator	1	30
SmokeRevoke	Calculator	1	12
MyQuit coach	Calculator	1	30
QuitSmokingApp	Calculator	1	21
Super power	Calculator	1	15
Stopsmoking	Calculator	1	15
MLC	Calculator	1	15
Free Butt Out	Calculator	1	30
NicoBlue	Calculator	1	9
Stop	Calculator	1	27
MyQuitTimeFree	Calculator	1	21
iSmoke too much	Calculator	1	21
No Smoking	Calculator	1	12
Breathe Now-Stop smoking Free	Statistic	2	26
Quit smoking Pro	Statistic	2	16
Quitify for quit smoking	Statistic	2	40
Get rich or smoking die	Statistic	2	38
Quit Smoking Now	Statistic	2	37

Quit Tracker	Statistic	2	13
Cigarette Analytics	Statistic	2	20
Reduce and stop smoking	Statistic	2	23
Quit smoking hypnosis-Stop smoking hypotherapy	Hypnosis	2	19
My Quit Smoking Coach	Hypnosis	2	39
Hypnosis for Quitting Smoking Guide Free	Hypnosis	2	35
Quit smoking hypnosis	Hypnosis	2	3
Smoke Free :Stop,Quit,No Smoking-Quit Tracker	Calendar	2	39
Smoke note-Quit Smoking	Calendar	2	29
Stop Smoking(wear support)	Calendar	2	29
Quit Smoking-No smoking day	Calendar	2	9
Smoke-Quit	Calendar	2	22
Quit Smoking Slowly	Calendar	2	19
Smoking Log	Calendar	2	10
Don't Smoke :30 days challenge	Calendar	2	13
Quit smoking	Calendar	2	36
Quit it-stop smoking today	Calendar	2	22
Quit Guide	Calendar	2	40
Quit Now!	Calendar	2	17
Kwit	Calendar	2	22
Tobano	Calendar	2	35
Quit Genius	Calendar	2	36
Stop smoking-quit smoking, be smoke free	Calendar	2	34
Qwit (Quit Smoking)	Calendar	2	22
Quit for treats-stop smoking	Calendar	2	37
Quit smoke	Calculator	2	22
Drop It! Quit Smoking	Calculator	2	17
Quit Smoking-Stop Smoking Counter	Calculator	2	40
I give up smoking	Calculator	2	23
Smoker stop	Calculator	2	28
Time to quit smoke	Calculator	2	31
Quit Smoking 30 days plan: Stop Smoking Tracker	Calculator	2	18
quitSTART	Calculator	2	38
No-cotine	Other	2	29
Stop Tobacco Mobile Trainer. Quit Smoking App Free	Other	2	46
Quit Smoking Tracker GOLD-stop smoking app	Other	2	33
Quit Tobacco	Other	2	32
Quit Smoking-Goodbye Tobacco	Other	2	16
Quit Smoking Now :Quit Buddy!	Other	2	20
Less Smoking : Quit Smoking gradually	Other	2	15
Flamy-quit smoking and become a non-smoker	Other	2	34
Stop smokin-EasyQuit Free	Other	2	15
Stop Smoking-Quit Smoking Tracker	Other	2	27
Smoke Free :Quit Smoking Now, Stop Smoking Forever	Other	2	40
Quit Now :MyQuitBuddy	Other	2	32

Note: Operating system (1-iOS ; 2-Android)

Table 4: Adherence score for iOS and Android

Operating System / Adherence Score	Total number of apps(n=100)		
	iOS (n=50)	Android (n=50)	Percentage of both operating system (%)
0-20 (weak)	46% (23)	32% (16)	39
21-40 (moderate)	50% (25)	66% (33)	58
41-60 (strong)	4% (2)	2% (1)	3

Table 5: Mean adherence score of iOS and Android application

Operating system	N	Mean Adherence score	Standard Deviation
iOS	50	22.20	10.258
Android	50	26.72	10.144

Table 6: Independent sample T-test comparing iOS and Android apps

		T-test for equality of means				
		t	df	Significance (2-tailed)	Mean difference	Standard Error difference
Adherence score	**Equal variances assumed**	-2.215	98	.029	-4.520	2.040