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Mobile Apps Application to Improve Safety and Health Knowledge, Attitude and Practice among University Students

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ABSTRACT
Introduction: The application of M-learning or mobile application (app) as a tool to disseminate occupational safety and health (OSH) information among students and staff in the university, to replace the use of conventional notice-board was assessed in this study. Materials and Methods: Study was conducted between February to March 2016 and involved 124 respondents from health sciences program in Universiti Putra Malaysia. OSH information was incorporated into a mobile-app using online software and respondents were requested to use the app for fourteen days. A self-administered questionnaire was used to assess the level of knowledge, attitude and practice of respondents before and after using the app. Results: The mobile app has significantly increased the knowledge score among respondents ($z = -7.331$, $p<0.001$). The mean (SD) of knowledge score has increased from 24.39 (5.84) to 30.40 (4.97). The attitude score also has significantly increased from 12.85 (2.04) to 14.02 (2.42) ($z= -4.587$, $p<0.001$). The mobile app was not significantly changed the practice ($z= -0.688$, $p=0.491$) and the perception among respondents ($z= -0.337$, $p=0.736$). Respondents stated that the app was user-friendly (49.4%, N=61), easy to access (N= 64, 51.6%), and have interesting contents (N= 63, 50.8%). They believed continuous used of the app may improve their knowledge (N= 64, 51.6%), and increase their awareness (N= 67, 54.0%) on safety and health. Conclusion: The M-learning (mobile app) has a potential to be used to promote the safety and health culture among students on the campus.

Keywords: Knowledge, Attitude, Practice, Safety and health, Mobile app

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INTRODUCTION

Over the past two decades, the concept of safety culture has become an important tool to reduce and prevent any injuries, fatalities and other incidents (1). The safety culture reflects the attitudes, values, and priorities of management and employees and their impact on the development, implementation, performance, oversight, and enforcement of safety and health in the workplace (2). The components of safety culture including attitudes, environment, and organization system that able to influence the development of safety culture in the workplace or an organization (3).

The effectiveness of safe work culture is influenced by the management roles, hazard anticipation, and safety training (4). Inadequate OSH knowledge and awareness, behaviour, practices, safety training, and information provided by the organization are the factors that contribute to work-related injury or work-related disease among young workers (5, 6). A continuous training programs that aims to educate the workers on OSH is important to increase the awareness of safe work culture as these factors able to influence human behaviour and their attitude and prevent and reduce the accidents at the workplace (7).

Behaviour (48%), human factors (39%) and environmental features (12%) contribute to occupational accidents (8). This has become a serious concern as the trend of work related death among young workers at the age of 20-24 years old has gradually increased from 177 in 2006 to 203 deaths in 2007 (9). Improvement on OSH knowledge and behaviour of the young workers is one of the approaches that can be done to reduce the OSH injuries and fatalities. Therefore, the basic skills of safety and health should be inculcated among the students before they get into a real work environment (5). It is important preparation for them to deal with any hazards in the workplace and at the same time, an accident or a fatality can be prevented and reduced.

The previous study has reported low awareness level (22%) about OSH among university students at the age of 18-23 years old (10). Ineffective use of conventional noticeboards in disseminating safety and health information on the campus was identified as one of the factors influencing students' awareness (10). The conventional noticeboard is a common way to disseminate information on campus. It's placed in the specific area and accessible to the students. Posters and notices were sticking on the noticeboard to facilitate communication in the community (11). Some advantages of conventional noticeboard are time-saving, keep people informed when network connectivity is not available and can be used in a variety of purposes, for examples, inspiring the students (posters, poems etc.) and providing information about the community resources.

Nevertheless, with the development of current information technology (IT), the use of conventional noticeboard seems to be outdated. Observation found information on the noticeboards were not updated, people might mutilate, remove or destroy the notices on the board that caused other people uninformed. In addition, the location of a noticeboard at the specific area might be less accessible and people do not have ample time going out and read all the information (11). The previous study on assessing the effectiveness of conventional noticeboard has reported most of the students (53.4%) preferred virtual noticeboard to deliver the information. A small group of students remain to use conventional noticeboards (28.9%) and some of them use both conventional and virtual noticeboards such as Facebook, Bluetooth, Email and Instant Messaging (17.7%) (12).

M-Learning is defined as the process of using mobile devices to access and study learning materials and to communicate with fellow students, instructors or institution (13). With the development of information technology (IT) nowadays, M-learning or mobile application (mobile app) can be used as a tool to disseminate safety and health information among students and staff in the university. Studies have reported the use of the mobile app containing high quality of educational materials able to directly influence students' attitude and behaviour (14, 15).

Furthermore, a smartphone can incorporate various types of mobile app and becomes popular especially among students or young people (16). The number of smartphone users among the young age group of 20-24 in 2014 was the highest compared to other age groups (24.5%) (17). It was increased from 14.0% in 2010 to 53.4 % in 2014 where 90.1% of smartphone users access to the internet via smartphone (18). Based on this fact, the use of the mobile application is seen as one of the effective methods to deliver the knowledge to the youngsters. The advantages of M-Learning are to increase the mobility where the user can access the information anytime and anywhere, time-saving, interactive method, and environmentally friendly by reducing the paper printing (15). Notwithstanding, the M-Learning might usable to some models and costly. It also requires a network connection to access to information.

Little is known about the potential use of the mobile app in the delivery of safety and health information on campus and how this application improves the students' awareness level. Thus, this study aims to assess the improvement of knowledge, attitude, and practice of safety and health among students through the mobile application. The findings of this study provide information on the feasibility of the use of the mobile app in disseminating the OSH information and inculcate safety culture to the students on the campus.

MATERIALS AND METHODS

Study Location

This is a quasi-experimental study design. The study was carried out between February to March 2016 at the Faculty of Medicine and Health Sciences (FMHS), Universiti Putra Malaysia (UPM). The FHMS was established on 1st August 1996. In 2017, there are about 1845 full-time students of FMHS from various fields of study (19). The undergraduate programs at FHMS including the Doctor of Medicine, and Health Sciences programs (Bachelor of Science) such as Biomedical Science (SBP), Nutrition and Community Health (PKK), Dietetic (DTK), Environmental and Occupational Health (KPP), and Nursing (NUR) (19).

Data collection

The population of the respondent consists of first-year undergraduate students from five health sciences programs at the FMHS, UPM. The program including the SBP, PKK, DTK, KPP and NUR. They were selected as respondents because they were new to the system in UPM and potentially to be less exposed to OSH information. Thus, the genuine improvement of their safety and health knowledge, attitude, and practice (KAP) are assessed merely from the use of the app and not from the information they gathered through classes or their peers.

The medical students in FMHS were excluded to be involved in this intervention study due to time limitation and differences in the semester break schedule. The cofounders in this study are knowledge, age, and OSH experience. These confounders were controlled by selecting only first-year students with the similar range of age, knowledge and OSH experience.

OSH Noticeboard checklist

The checklist was used during the assessment of OSH noticeboards at the FHMS. It was adopted and modified from (20) that consist of four required criteria to assess

an OSH noticeboard as follows;

- Contains any posters related to the safety and health
- Contains members of the Emergency Response Team (ERT)
- Has updated OSH bulletins and safety alerts
- No personal advertisements, unrelated flyers, brochures etc.

Questionnaire

Respondents' knowledge, attitude and practice of safety and health were recorded through the self-administered questionnaire before and after the mobile app usage (intervention). The questionnaire was adopted and modified from (10) that consists of seven parts of questions as follows;

Part A: Respondent's background (gender, course, semester, race, and age.

Part B: Respondent's perception regarding the current delivery method of Safety and Health info in the university.

Part C: Respondent's knowledge level on OSHA (Act 514), policy, accident and emergency procedure.

Part D: Respondent's perception on safety and health (i.e. Procedure and emergency action requirement)

Part E: Respondent's attitude level towards the safety and health culture in the university (i.e. respondent follows the university rules, procedure or instructions, save the emergency number)

Part F: Respondent's practice level on safety and health.

Likert scales Level 1 (strongly disagree) to 5 (strongly agree) were used to evaluate the statements in the questionnaire. The reliability of the questionnaire with the Cronbach' Alpha value of 0.914 was recorded.

Mobile Application

The Safety and Health mobile app application was developed by using online AppShed Academy (21). Internet connection is needed to access the information on the app. The app is in bilingual (English and Malay language) to allow the respondents to choose their preferred language. It contains nine information segment as follow;

Health: Food and Diet, Exercise, Stress Management, Family, Sleep Management and Healthy Tips.

Safety: Safety Definition, Safety Condition Sign, and Unsafe Condition and Act.

Hazard: Definition of hazard, hazard category, and hazard pictogram.

OSH Act: Occupational Safety and Health Act Regulation (Act 514)

OSH UPM: Occupational Safety and Health Management office UPM, and FMHS

Lab Rules: General Guidelines of the Lab, Clothing in the Lab, Accident and Injury Actions, Chemical Handling, Glassware and Equipment Handling, Heating Substances and Emergency Number of Laboratory.

Emergency: Emergency number of colleagues, University Health Centre, and Security Department of UPM.

Students: Student's responsibilities and safety and health practices on the campus.

Maps: Additional Info.

Fig. 1 shows the information icon built for the Safety and Health Mobile application. The link and QR Code (Quick Response code) were tested to ensure it can be assessed before introduced to the respondents during the intervention.

Duration of the intervention study

There were three stages of the intervention study that was conducted;

- The first stage was the pre-intervention stage where the self-administered questionnaire was distributed among respondents to identify the current level of knowledge, attitude, and practice of respondents on safety and health.
- The second stage is known as intervention stage. During this stage, the mobile app was introduced to the respondents. The link and QR Code of the mobile app were given to the respondents for them to access the application with the accessibility to the internet connectivity. The respondents required to use the app for fourteen (14) days.
- The last stage was the post-intervention stage. During this stage, the post self-administered questionnaire was distributed among the respondents to identify the improvement of respondents' knowledge, attitude, and practice of safety and health after the use of mobile app in the intervention stage.

The ethical approval was obtained from the Ethics Committee for Research Involving Human Subject, Universiti Putra Malaysia (JKEUPM). Respondents were given an explanation of the study procedures and all information obtained was confidential. Written consent was obtained from the respondents prior to the study.

Data Analysis

All data were analysed using the SPSS (Statistical Package for Social Sciences) software. The descriptive statistical analysis was performed to obtain the mean and standard deviation of variables in the study. The Chi-square test was performed to determine the association between the variables. And for the comparison of knowledge, attitude, practice, and perception of safety and health between health sciences programs, the Kruskal-Wallis test was used. The changes of knowledge, attitude, and practice before and after mobile app usage were analysed using the Wilcoxon signed-rank test. The Spearman's rank-order correlation also was performed to determine the

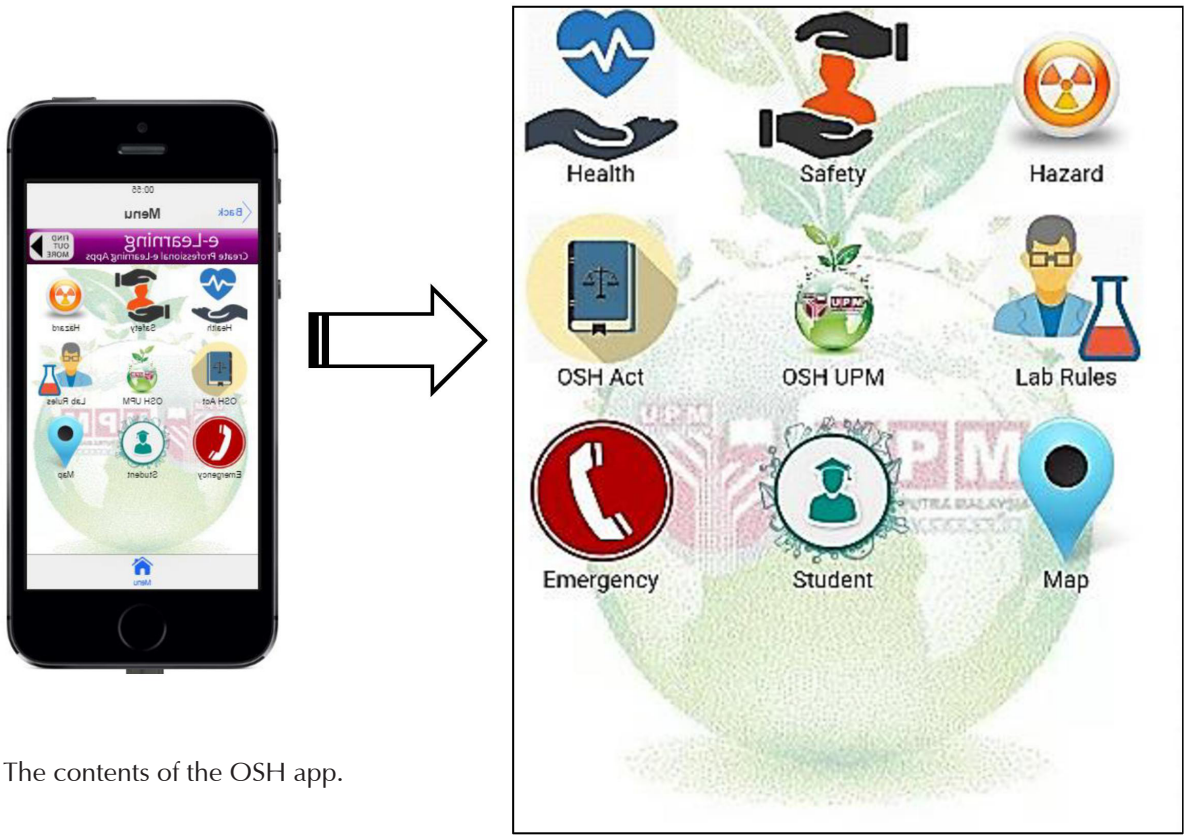

Fig. 1: The contents of the OSH app.

relationship between knowledge, attitude, and practice of safety and health.

RESULTS

Socio-demographics of Respondents

The details of the respondents' socio-demographic are shown in Table 1. A total of 124 first-year students were involved in the study. They were chose from five health science programs including Environmental and Occupational Health (EOH) program (N = 33), Biomedical Science (Biomed) (N = 30), Nutrition and Community Health (Nutrition) (N = 28), Dietetic (N = 18) and Nursing (N = 16). Majority of the respondents was female (N=106, 85.5%), Malays (N=103, 83.1%) and between 19 to 22 years old (mean ±SD: 20.0±0.46).

OSH Delivery Methods and Knowledge, Attitude, and Practice (KAP) Level

Table II shows the respondents' response to the survey statements regarding the current OSH information delivery methods in the university. Almost half of the respondents in this study (52.4%, N = 65) were not aware of the updated OSH information on the faculty noticeboards. They also were not aware of the OSH information provided on the university's website (N = 56, 45.2%) as well as through the lecture (N = 46, 37.1%).

The level of OSH knowledge of majority respondents were at moderate level (79%, N=98). Similar trend was observed for OSH attitude (N=100, 80.6%) and practice (N=89, 71.8%) (Table III). The knowledge score about safety and health was significantly higher among the EOH students compared to other programs with the mean ± SD of 26.50±4.76 ($x^2=12.39$, p=0.02) whereas the practice score was significantly higher among dietetic students with the mean ±SD of 28.72±4.65 ($x^2=10.57$, p=0.03). There was no significant difference on the attitude ($x^2=2.94$, p=0.57) and perceptions scores ($x^2=2.74$, p=0.60) by the programs (Table IV).

KAP, and Perception after the Intervention

The used of safety and health mobile app for 14 days has increased the number of respondents in category good knowledge (from 11.3% to 21.8%), good practice (from 17.7 % to 21.8%) and good attitude (from 16.1% to 17.7%) (Table III). However, the intervention has increased the number of respondents in category poor knowledge (from 9.7% to 12.9%), and poor attitude (from 4% to 7%). Meanwhile, the number of respondents in category poor practice has decreased from 10.5% to 7.3% after the intervention (Table III). The mobile app also has significantly increased the knowledge scores in all programs as can be seen in Table IV. Overall, the app has significantly improved the knowledge score from 24.39 to 30.40 (z = -7.331 and p<0.001) as well as the attitude score from 12.85 to 14.02 (z= -4.587, p<0.001) (Table V). No significant improvement was observed in practice and perception scores.

The bivariate correlation test was used to determine

Table I: Socio-demographic characteristic of respondents (N=124).

Variables	N (%)
Age (Mean ±SD) = (20.0 ±0.46)	
19	12 (9.7)
20	102 (82.3)
21	9 (7.3)
22	1 (0.8)
Gender	
Male	18 (14.5)
Female	106 (85.5)
Races	
Malay	103(83.1)
Chinese	10 (8.1)
Indian	4 (3.2)
Sabah & Sarawak Natives	7 (5.6)
Previous Education	
STPM	3 (2.4)
Matriculation	47 (37.9)
ASASI	73 (58.9)
Diploma	1 (0.8)
Program (current Degree)	
SBP	30 (24.2)
KPP	32 (25.8)
PKK	28 (22.6)
DTK	18 (14.5)
NUR	16 (12.9)
Working Experience	
Yes	49 (39.5)
No	75 (60.5)

the relationship between the knowledge score with the practice and attitudes before and after using the app as shown in Table VI. There was a significant relationship between knowledge and practice before (r = 0.185, p = 0.040) and after the app usage (r = 0.381, p= <0.001). Significant relationship between attitude and practice was observed before (r = 0.392, p = <0.001) and after the app usage (r = 0.302, p= <0.001). There was no significant relationship between knowledge and attitude before (r = 0.028, p = 0.758) and after (r = 0.174, p = 0.053) the app usage.

Respondents stated that the mobile app was user-friendly (49.4%, N=61) and easy to access (N= 64, 51.6%). It has interesting contents about safety and health (N= 63, 50.8%) which with continuous use able to improve their knowledge (N= 64, 51.6%) and increase their awareness (N= 67, 54.0%).

Association between Socio-demographic Characteristics and KAP

A Pearson's chi-square test (with alpha value = 0.05) was used to evaluate the association between socio-demographic characteristics and the scores' level of KAP of the respondents in this study as shown in Table VII. Gender (χ^2 = 6.50, p = 0.04), and study program (χ^2 = 22.26, p = 0.004) were associated with the knowledge levels while respondents age was associated with the practice score (χ^2 = 16.32, p = 0.01). Meanwhile, races (χ^2 = 18.83, p = 0.004) was associated with the attitude.

DISCUSSION

Majority of the respondents in this study were female and aged 20 years old. This is a normal population

Table II: OSH information delivery methods in the university (N=124)

Survey Statement	Distribution of Response N (%)					Mean ±SD score
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Receiving the safety and health information during the lecture.	6 (4.8)	15 (12.1)	46 (37.1)	45 (36.3)	12 (9.7)	3.34 ± 0.98
Assessing and obtaining the safety and health information on the website of Occupational Safety and Health Management Department (JPKKP), UPM.	8 (6.5)	20 (16.1)	56 (45.2)	32 (25.8)	8 (6.5)	3.10 ± 0.97
The safety and health information on the faculty OSH noticeboards are updated.	3 (2.4)	8 (6.5)	65 (52.4)	39 (31.5)	9 (7.3)	3.35 ± 0.81

Note: Likert scale, 1 is strongly Disagree, 2 is Disagree, 3 is Neutral, 4 is Agree, 5 is Strongly Agree

Table III: The Knowledge, Attitude, and Practice scores among respondents before and after the intervention.

	Before Intervention, N (%)			After Intervention, N (%)		
Variable	Good	Moderate	Poor	Good	Moderate	Poor
Knowledge	14 (11.3)	98 (79.0)	12 (9.7)	27 (21.8)	81 (65.3)	16 (12.9)
Attitude	20 (16.1)	100 (80.6)	4 (3.2)	22 (17.7)	95 (76.6)	7 (5.6)
Practice	22 (17.7)	89 (71.8)	13 (10.5)	27 (21.8)	88 (71.0)	9 (7.3)

N=124

Table IV: Comparison of KAP between different programs before and after the mobile app usage

		Before		After	
Level	Program (n)	Mean score (±SD)		Mean score (±SD)	
Knowledge	Biomed	23.17(6.02)		27.73(4.73)	
	Nutrition	22.79(5.53)		31.64(4.08)	
	Dietetic	25.44(7.87)	12.39*	29.61(6.11)	24.96*
	EOH	26.50(4.76)		33.16(4.09)	
	Nursing	24.13(4.27)		28.62(3.84)	
Attitude	Biomed	13.03(2.37)		13.40(2.82)	
	Nutrition	12.89(1.73)		13.61(2.35)	
	Dietetic	12.83(2.48)	2.94	14.78(2.10)	9.11
	EOH	13.09(1.69)		14.22(2.38)	
	Nursing	12.00(2.00)		14.68(1.96)	
Practice	Biomed	27.13(4.32)		26.63(3.87)	
	Nutrition	25.96(3.83)		26.11(3.12)	
	Dietetic	28.72(4.65)	10.57*	27.94(4.28)	4.73
	EOH	28.44(3.98)		27.72(3.16)	
	Nursing	25.50(4.31)		27.19(3.10)	
Perception	Biomed	19.67(2.44)		19.00(2.18)	
	Nutrition	19.57(2.33)		20.46(2.91)	
	Dietetic	20.61(3.74)	2.74	19.67(2.54)	9.27
	EOH	20.56(2.76)		20.53(2.46)	
	Nursing	20.50(2.34)		21.06(2.41)	

N=124, *p-value <0.05 is statistically significant; Kruskal-Wallis test

Table V: Knowledge, Attitude, and Practice levels before and after the intervention.

	Intervention			
Variables	**Before**	**After**		
	Mean(±SD)	**Mean(±SD)**	**z**	**p**
Knowledge	24.39(±5.84)	30.40(±4.97)	-7.331	**<0.001***
Attitude	12.85(±2.04)	14.02(±2.42)	-4.587	**<0.001***
Practice	27.23(±4.28)	27.06(±3.52)	-0.688	0.491
Perception	20.12(±2.71)	20.09(±2.57)	-0.337	0.736

N=124, *p-value <0.05 is statistically significant; Wilcoxon signed-rank test.

Table VI: The relationship between knowledge, attitude, and practice of safety and health among respondents.

Level	**Before**		**After**	
	r	p	r	p
Knowledge – Practice	0.185	**0.040***	0.381	**<0.001***
Attitude – Practice	0.392	**<0.001***	0.302	**<0.001***
Knowledge – Attitude	0.028	0.758	0.174	0.053

N=124, *p-value<0.05 is statistically significant; Spearman's rank-order correlation

Table VII: The association between scores (good, moderate, poor) of knowledge, attitude, and practice and socio-demographic.

Variables	**Pre-Intervention**						**Post-Intervention**					
	Knowledge		Attitude		Practice		Knowledge		Attitude		Practice	
		p		p		p		p		p		p
Age	5.47	0.49	3.14	0.79	16.32	***0.01**	5.23	0.52	10.65	0.10	5.29	0.51
Gender	0.42	0.81	2.64	0.27	3.11	0.21	6.50	***0.04**	2.18	0.34	2.88	0.24
Races	3.80	0.70	4.53	0.61	7.79	0.25	6.85	0.34	18.83	***0.004**	2.03	0.92
Previous Education	2.15	0.91	5.04	0.54	11.91	0.06	2.78	0.84	3.43	0.75	4.87	0.56
Programs	9.81	0.28	13.99	0.082	8.34	0.39	22.26	***0.004**	10.09	0.26	9.105	0.33
Working Experience	0.11	0.95	0.19	0.91	0.47	0.79	3.78	0.15	0.06	0.97	2.23	0.33

N=124, * p<0.05 is statistically significant; chi-square test

obtained in the university as more female involved in education. The present study also reported that 83.1% of the respondents were Malay as the majority ethnic in the country, which is 67.4% of Malaysia's population is Bumiputera (22).

In this study, more than half of the respondents were not aware of the safety and health delivery methods on the campus. They were not aware of the safety and health website and the existence of the OSH noticeboards on the campus. Some of the possible factors to these problems are lack of safety and health promotion programs (10) and inefficient a noticeboard location on the campus (12). There are 50 OSH noticeboards were found all over the FMHS buildings (laboratory blocks, lecture halls, and administration block). Unfortunately, most of the OSH noticeboards at the FHMS contained unrelated information such as personal advertisements and extraneous flyers.

The findings of the present study have shown that the majority (74%) of the respondents has moderate levels of safety and health KAP. The previous study reported that only 29% (37 out of 129) of public university students in Klang valley knew about the OSH procedure and policy on the campus (10). However, a study by (23) has revealed that 97.80% (401 out of 410) of school children have a good knowledge and awareness of safety and health (23).

According to (16) students' safety and health KAP can be influenced by inefficient OSH information delivery method and lack of management roles to expose, educate, and promote the safety culture in the university (10). As stated in Occupational Safety and Health and Regulations (Act 514), section 15 (1), the duty of an employer is to ensure as far as is practicable the safety, health, and welfare at work of all his employees including to provide such information, instruction, training and supervision as are necessary to ensure the safety and health at work of his employees or people other than his employees (24). Therefore, in the context of a university, the top management of a university has to play their roles in disseminating the information to the staff and students for them to aware of their safety and health on the campus.

The knowledge scores of OSH are significantly higher among EOH students compared to other programs. This is because EOH students were already exposed to the safety and health information in their courses. In their first year of study, they have learned some basic safety and health subjects such as the principle of hazard, safety and health policy and related acts and regulations. The dietetic students have higher practice scores compared to other programs. This is possible because most of the subjects in the dietetic involved laboratory work in their first year and students have been trained strictly to wear safety equipment or personal protective equipment (PPE) such as gloves, mask, and shoes during the laboratory session. They have also been informed to read the safety instruction and procedure thoroughly so that they know how to respond during the emergency. No significant difference in attitude and perception scores were observed by the programs. This indicates that both of these domains were similar regardless of what program the student is.

The use of safety and health mobile app for 14 days in this study has significantly improved the knowledge and attitude scores. However, no significant improvement was observed in the practice and perception scores. In the previous study by (17) also reported that use of mobile app has improved the safety and health knowledge among students. According to (25) people are easy to learn when they turn on their smartphone to look up information. However, respondents might fail to remember some information on the app after the intervention. This is possibly one of the reasons increased in poor knowledge (from 9.7% to 12.9%) after the intervention. Nonetheless, mobile app uses able to improve students' performance and productivity in their learning process (26). It provides the opportunity for the users with new opportunities and changes their attitudes depending on the content quality of the app (27). In this study, the use of the mobile app has improved respondents' attitudes of safety and health as the app contains useful information that can be applied in their daily life.

In this study, the use of the mobile app in OSH education and awareness has increased the knowledge and attitude levels of the respondents. However, the finding does not change the practice and perception of the respondents. This is consistent with the results of the previous study where improvement was determined on individuals' knowledge and practice level in the safety and health campaign but not the attitude-wise (28, 29). Among the elements that improve was stated as the knowledge of the occupational law (35.7 to 64.3%), proper management of chemical spill (0 to 100%), and knowledge of hazards (0 to 100%) (29).

The present study has reported that there is a significant relationship between knowledge and practice (before the intervention, $p = 0.040$ and after the intervention, $p < 0.001$). This shows that knowledge considered as an important component in promoting a good practice of safety and health. A significant relationship also was found between attitude and practice (before the intervention, $p < 0.001$ and after the intervention, $p < 0.001$). The finding is expected to provide an intention to the university management to conduct safe and healthy attitude programs on the campus as an effort on improving the students' practice level toward safety and health. These supported by the previous theory that has explained a good safety culture is significantly related to individual knowledge, attitude, and a management (30).

The mobile app approach that was used in this study has changed the KAP of safety and health among the respondents. After the intervention program, they have saved the emergency contact number on their phone. They were also willing to report any unsafe act, follow the safety instructions and aware of the existence OSH policy on the campus. More than 50% respondents believed that the M-Learning tool or mobile apps can improve their knowledge and awareness on safety and health as they tend to use a smartphone during their spare time as a medium to access and gain information (16). This is also reported in a previous study where most of the university students preferred the approach to be used in their learning process (31).

CONCLUSION

The present study is managed to apply the sustainable approach of information technology through the use of the mobile application in educating and disseminating the safety and health information among the university students. Moreover, it is a useful tool that can be applied to improve knowledge and awareness levels among the youngsters. This study also provides a baseline data on the effectiveness of the mobile app usage, to improve KAP level of safety and health among the students.

However, some of the study limitations were remarked. The samples of the study were un-homogenized samples where the study population only focused on the first year of health sciences program that cannot be generalized to represent the whole university students in the country. The findings should be interpreted with care and should take into account this limitation. In addition, there also lack available data on the intervention study regarding safety and health among university students in Malaysia which can be used as a reference or as a comparison. This study unable to see the changes in the attitude and practice of the respondents due to the short period of observation. With a long period of experimentation time, changes could possibly be observed.

In conclusion, the results of this study implied that the current methods used to deliver the OSH information are not adequate or effective enough. This was found during the observation where the notice boards were left with empty and un-updated information. Most importantly, students did not aware of the existence and function of these notice boards. Based on this finding, the university management is suggested to use more effective methods to disseminate the safety and health information on the campus.

The average knowledge, attitude and practice levels of safety and health among university students were at moderate levels (74% of the respondents). The mobile application has improved knowledge scores (from 24.39 to 30.40, $p<0.001$) and attitude scores (from 12.85 to 14.01, $p<0.001$) significantly. However, there was no impact noted in practice ($p=0.49$) and perception ($p=0.736$) with the usage of the mobile app. In general, long time is needed to change the individual practice. In this study, there was a significant relationship between knowledge and practice, and attitude and practice. This indicates a good knowledge and attitude will contribute to a good practice. The safety and health mobile app as an M-Learning through smartphone able to influence student's attitude and behaviour and improve their knowledge and awareness.

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