

The Effectiveness of Animation-Based Occupational Health Training on Knowledge, Attitudes and Practice in Occupational Health for Thai Health Workers

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Background: Occupational health education is an important strategy for the prevention and control of occupational health problems in a hospital setting. Health workers (HWs) typically face obstacles to their training, often due to time restrictions and their workload.

Objectives: 1) to test the effectiveness of classroom training using PowerPoint slides with supporting narration and watching animation to improve the knowledge, attitudes and practice (K-A-P) of HWs in occupational health; 2) to prove that training using animation-based is not that different from training using narration-based, particularly for different educational levels.

Materials and Methods: The non-randomized control group pretest-posttest design was conducted in a community hospital in Samutsakorn province, Thailand. The participants were divided into two groups by voluntary participation in each class, with an unknown method of training. The pretest and demographic data were conducted to examine their background, baseline knowledge, attitudes and the practice of occupational health for HWs. Then, the first group started training using a PowerPoint presentation with supporting narration in the classroom by an occupational physician, while the second group was trained by watching animation. After they finished each training session, the same questions on the posttest were retested. The Mann Whitney U test was utilized to compare the score between two methods while the pretest and posttest scores were compared with the Wilcoxon Signed Rank test.

Results: The participants in this study consisted of 94% of HWs who came to training. They were mostly female, middle-aged, graduated with a Bachelor's degree or higher and worked close to patients, such as nurses. There were no statistically significant differences between two groups in terms of background, baseline overall score and each K-A-P score of occupational health for HWs. After training, using each method in each group, the posttest of K-A-P and overall score of both groups were increased and the differences in scores were statistically significant when compared to their pretest scores (p -value <0.001). HWs who trained with animated-based material, particularly well-educated health workers had an increased K-A-P score, higher than narration-based training, but not different in terms of statistical significance.

Conclusion: Animation is an effective media and does not differs from conventional methods. It was suitable for occupational health education among HWs. The production of new and modish alternative occupational health training media should be encouraged in this field. It could be applied to help to enhance HWs achievement to protect their health at work.

Keywords: Occupational health education, Health worker training, Animation

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In recent decades, there are increasing numbers of health workers (HWs) due to developing the economy and the improvement of the public health system. HWs are among the top three occupations in the service sector of the labor force. This occupation has a high risk of exposure to the many hazards in a working environment and working

conditions that could affect their health⁽¹⁾. As a human right, all workers must have health protection at work. The WHO recommended that the relevant parties should follow occupational health procedures in this population⁽²⁾.

In occupational health practice, there are many preventive methods to protect workers from experiencing hazards at work. One of them is occupational health education for the attitude and behavior changes that are an important part of occupational health and safety prevention and control. It could be conducted in different contexts and as tools for education and training in occupational health, such as narration-based⁽³⁾, project-based⁽⁴⁾, coaching⁽⁵⁾, competency-based⁽⁶⁾, guidelines⁽⁷⁾ accompanied by modern methods of problem-solving, distance learning, organized self-education and self-assessment. Face to face educational training in the

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classroom, such as narration-based training, is the most conventional method and therefore favored and utilized in most workplaces. It could be used to increase or develop the capacity of workers regarding the prevention of injury and the promotion of their health. However, this method has some obstacles. It takes a long and fixed period of time that disturbs the working time of both trainers and trainees, particularly in a hospital setting.

Since 2009, the Ministry of Public Health in Thailand has implemented occupational health for HWs policy⁽⁸⁾. Several hospitals have developed their own occupational health for HWs educational training programs. These types of programs have been used to improve their knowledge of and attitudes to occupational health. However, all of them are narration-based training in classroom. All HWs must spend a great deal of time to focus on service care. The loss of service time in classroom training may be related to patient safety.

In recent years, information technology has become a part of daily life. A number of workplaces have utilized information technology for work, including training by media. Media is one possible and effective method, both as a promotional tool and to increase the likelihood of success⁽⁹⁾. Animation is an active learning approach which intensifies the acquisition and the verification of knowledge and skills, following changes in mentality and behavior. Occupational health in a healthcare setting must also include all HWs. As a result, the training must be conducted using a proficient method. However, animation is still a new educational media tool for learning occupational health and safety among Thai HWs, who did not clarify the effectiveness of this method. Therefore, the objective of this study was to test the effectiveness of PowerPoint presentations with supporting narration by an occupational physician and animation-based training in the classroom and proof that animation-based training is not different to narration-based training, particularly at different educational levels, including methods to improve knowledge, attitudes and practice (K-A-P) in occupational health for Thai HWs to protect their health at work.

Materials and Methods

A non-randomized control group pretest-posttest design was employed in the present study. The subjects of the study included 72 HWs who worked in a single community-based government hospital in Samutsakorn province. This hospital had never developed occupational health education for their HWs. The hospital set up the occupational health and safety training on the same topic in two classes. The HWs were voluntary participants in each class with an unknown method of training. However, to avoid the ethical issues in terms of justice and response bias, this study selected all of the participants in the class who volunteered.

At the beginning of training, they were verbally informed about consent with regard to this study, which was conducted prior to data collection. The tests were anonymous and the running number of test was used to identify and to

make comparisons between the pretest and posttest scores of each person. The pretest was assessment about their baseline knowledge, attitudes and behavior of occupational health for HWs. The demographic data, including age, gender, duration of employment in a hospital, education, job position and administration, history of occupational injuries or diseases at the hospital were collected as well. Then, the first class 50 minute PowerPoint presentations with supporting narration by an occupational physician, while the other class started their training by watching a 20 minute animation. Both of the classes were conducted in the same classroom and on the same day of the week to create a more controlled environment for learning. After finishing each activity, such as the posttest, identical questions were used to measure their improvement. Finally, after finishing the posttest, each group also received a crossover of other training methods. The test consisted of 30 true-false or yes-no questions about the issue of occupational health for HWs; including 10 questions about knowledge, such as “Does the concept of occupational health for HWs cover the health of the HWs and their working environment?”, followed by 10 questions about attitudes, such as “In my opinion, hospitals have hazards less than factories” and 10 questions about practice, such as “When you are burned out from work, the best practice is to rearrange your work schedule, socialization and positive thinking”. The test was scored by counting the correct answers. Each question was developed and tested for test-retest reliability among nurses to establish the clarity of the questions. All of the questions had a percentage of agreement over 80%.

The animation is a cartoon developed by the occupational health and safety network in Thai medical schools (Figure 1). It is composed of two parts, displayed in the Thai language and with a duration of 20 minutes. The first part presents the hazards in a hospital while the second teaches self-care. Hazards in hospitals and prevention measures included physical factors such as light, radiation, heat; chemicals such as chemotherapeutic drugs; biological factors such as airborne and blood-borne infectious agents; ergonomic factors such as patient transfers; psychosocial issues such as shift work and accidents at work. The idea of

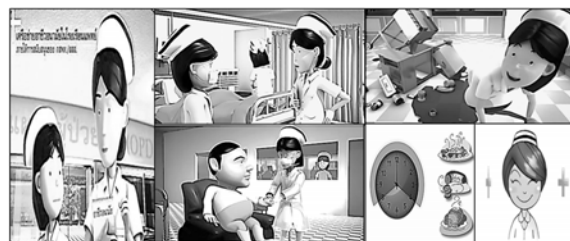


Figure 1. Some scenes from the animation about hospital hazards and self-care (Part 1 and 2 at <https://www.youtube.com/watch?v=fcszFdljHQI> and <https://www.youtube.com/watch?v=Pq2fVQfcOY>).

self-care is communicated in the concept of 3E's-Eating, Exercise, Emotion. On the other hand, narration-based training also teaches the same concept and content as animation-based training, but has a longer duration due to having to make explanations. It consists of rationale, occupational hazards, health prevention and health promotion.

The data analysis was performed using SPSS version 21.0 (IBM, Armork, New York). This process began with normal distribution testing and each variable classified as continuous data was tested by a Kolmogorov-Smirnov (KS) test. This was followed by a descriptive analysis, the continuous data, such as age, duration of work, K-A-P score and included each domain, the total score and the improved score was described by mean, standard deviation, median and range. The categorical data, such as gender, education, job position, administrator, job history, and occupational injuries or diseases in the hospital was described by number and percentage. The KS test of the continuous data was also significant. As a result, the inferential analysis utilized a non-parametric test. Firstly, The Mann Whitney U test was utilized to compare the scores between two methods while the pretest and posttest scores were compared with the Wilcoxon Signed Rank test. In terms of the categorical data, a Chi-square test of Fisher's exact test was utilized to compare the differences between categories. The statistical significance was set up at a p -value $<0.05^{(10)}$.

Results

In terms of participation in this study, 94% of the HWs (68/72) came to training. The demographic data of the participants was shown in Table 1. Most of the participants were female (72.1%), graduated with a Bachelor's degree or higher (70.6%) and a job in close contact with patients

(61.8%). The mean age and duration of work were 34.72 ± 11.1 years (range 19 to 57), 11.78 ± 10.7 years (range 1 to 34), respectively. In terms of age, 57.4% of the population was aged over 30 years and 7.4% of the participants had an administrator or job title. Half of the participants had a history of occupational injuries or work related problems, including needle stick injuries and musculoskeletal disorders. There were 35 HWs participating in learning by using PowerPoint slides with supporting narration in the classroom, while 33 HWs participated in animation-based learning. The demographic data of each group was shown in Table 1. There were no statistically significant differences in background between the two groups.

The baseline overall score and each K-A-P score of occupational health for HWs before training in each method was at a median level and the lowest score was in the dimension of attitudes. There were no statistically significant differences in terms of overall and pretest scores in each dimension. After training with each method for each group, the K-A-P and overall score of both groups increased at a statistically significant in comparison with the pretest score (p -value <0.001). HWs who trained with animation had an increased overall score higher than narration-based training, but no statistically significant differences between these two methods (Table 2).

The score significantly increased in all domains after watching the animation. The domains of attitudes, knowledge and practice changed the score from the highest to lowest, respectively. When stratified by educational level, the increased scores were the highest among less-educated HWs. The well-educated HWs who trained with animation-based training had higher scores than those who had narration-based training. However, the less-educated HWs in the

Table 1. The demographic data of the study samples and two training methods

Demographic data	Narration-based n = 35 (%)	Animation-based n = 33 (%)	<i>p</i> -value
Age (year)	33.8 ± 11.6 (median 31; range 19 to 57)	35.7 ± 10.7 (median 32; range 20 to 54)	0.347
Duration of work in a hospital (year)	11.46 ± 10.7 (median 10; range 1 to 32)	12.12 ± 10.8 (median 8; range 1 to 34)	0.702
Gender			0.336
Male	8 (22.9)	11 (33.3)	
Female	27 (77.1)	22 (66.7)	
Education			0.491
Lower than Bachelor's degree	9 (25.7)	11 (33.3)	
Bachelor's degree or higher	26 (74.3)	22 (66.7)	
Job position close to patient			0.849
Yes	22 (62.9)	20 (60.6)	
No	13 (37.1)	13 (39.4)	
Administrator			0.668
Yes	2 (5.7)	3 (9.1)	
No	33 (94.3)	30 (90.9)	
Occupational injury or disease in hospital			0.467
Ever	19 (54.3)	15 (45.5)	
Never	16 (45.7)	18 (54.5)	

narration-based training group still had a higher increase in their scores when compared with the animation-based training group (Table 3).

Discussion

The development of K-A-P for HWs through various methods or tools represented an element of prevention and manage occupational health problems and ideal for HWs who are visual learners and could identify health issues and well-being in the hospital. Therefore, the purpose of this study is to test whether or not animation-based training was effective and did not differ from narration-based training by an expert. According to the hypothesis, animation media is a new trend in self-directed learning tools and can assist in learning occupational health for HWs trainees. The results showed that most of the participants in this study had a high level of education, average work duration in this hospital of more than 10 years and experience with occupational injuries or diseases. The background data revealed that these factors may have resulted in a protective experience and they had good K-A-P regarding occupational health in a hospital⁽¹¹⁾. This may be why the baseline scores of the participants were medium. After training with animation-based learning compared to narration-based

training, the results showed the occupational health education with animation effectively improved their knowledge as well as their attitudes to and practice of occupational health and safety for HWs. This was not so different to narration-based training in the classroom. According to dual coding theory, animation-based training and using PowerPoint slides with supporting narration used both visual and verbal components⁽⁹⁾; learning with animation, however, was an easily coherent visual and verbal presentation, with quick rapidly developed mental models of system functions, thus making them more effective for higher education learners. In addition, learning with this method also provides opportunities for learners to build connections in their memory⁽¹²⁾.

The effectiveness of animation-based training increased the awareness and the knowledge of HWs to gain adequate competence to protect their health and prevent diseases. This was described and supported by the studies of Wallen ES and Mulloy KB in various groups^(12,13). They also claimed that computer-based training, such as animation-based training were based on the cognitive learning theory that supported higher levels of learning more than conventional training methods. Therefore, it was found that highly educated learners were able to use their knowledge in a more creative

Table 2. Mean and standard deviation of pretest and posttest scores between narration-based and animation-based training methods

Test score	Narration-based n = 35 (%)	Animation-based n = 33 (%)	p-value
Pretest score			
Knowledge	8.03±1.5	7.85±1.3	0.502
Attitudes	6.91±1.4	6.94±1.8	0.673
Practice	7.11±1.4	7.36±1.5	0.454
Total	22.06±3.3	22.15±3.3	0.868
Posttest score			
Knowledge	9.11±0.6	9.03±0.8	0.874
Attitudes	8.31±0.9	8.61±1.4	0.142
Practice	8.37±1.3	8.88±1.5	0.033
Total	25.80±2.1	26.50±2.9	0.078
Difference in the score between the pretest and the posttest	3.74±2.5	4.36±2.6	0.359

Table 3. Mean and standard deviation of pretest and posttest scores between two training methods and stratified by educational level

Test score	Lower than Bachelor's degree			Bachelor's degree or higher		
	Narration-based (n = 9)	Animation-based (n = 11)	p-value	Narration-based (n = 26)	Animation-based (n = 22)	p-value
Total pretest score	18.44±2.7	20.18±3.0	0.201	23.31±2.5	23.14±3.1	0.933
Difference in the score between the pretest and the posttest	5.67±2.7	4.72±2.5	0.503	3.07±2.1	4.18±2.8	0.194

way and achieved higher scores in the animation-based group, while the scores of the less educated learners in the narration-based group also increased. The narration-based training allowed the trainer more opportunities to make explanations to trainees but require more time for training. However, both training methods have proved to be effective for HWs.

With reference to the work characteristics of HWs in government hospitals, they always had heavy workloads and high amounts of stress. As a workplace, hospitals are open 24 hours a day and the HWs performed their duties after daytime working hours and with very little rest. As a result, HWs may have had time constraints in terms of learning about these issues. Any training among this group should be more flexible, concise and relaxed⁽¹⁴⁾. However, traditional training method of sitting, in a classroom is limited. Thus, such materials as animation may be more attractive and more effective for training. In practical terms, it can be more flexible for learners, save time and be more suitable for continuous occupational health education and learning in a health care setting⁽¹²⁾. However, the limitation of the media used is a factor for interactive learners. This study on animated-based learning mainly focused on content, while future studies should be concerned with learning management systems and modes of communication⁽¹⁵⁾.

The strength of the study is the concern about other factors that may influence learners, such as environment and the educational level of the learner. Therefore, this study controlled the factors and has a comparison group with no different background for proof of the real effects of study intervention. However, this study still has limitations. It was performed within one hospital. Future replication studies are needed to establish whether or not the present results can be generalized and applied in other hospitals. As the short lag time between pretest and posttest, recall of the questions in the test may result in a higher score. Some of the questions in the practical domain may not reflect the actual behavior of HWs. A re-evaluation or observation after the participants went back to their routine work should be recommended for future studies in order to test the long-term retention of K-A-P rather than examination with pretests and posttests.

Multimedia education employs various methods, but a new method for the 21st century is animation. It is one form of media suited for supplementary or complementary media. Furthermore, it is easy to understand, not in a more educational format, relevant, could increase in usability and convenience, and individual learning needs that are appropriate for workers in a professional culture. It may also empower HWs to promote their health and prevent illness or hazards while working in a hospital. The field of occupational health still needs more of both, as well as more effective media in order to sensitize and transfer knowledge to workers.

Conclusion

Animation is one choice of occupational health educational material for training that was similar to other formats and had a high degree of effectiveness. It could enhance

awareness and knowledge regarding occupational health for HWs in terms of their well-being, particularly among highly educated staff members. The production of new and jaunty alternatives for occupational health training media should be encouraged in this field and may help HWs to protect themselves from negative health effects at work.

What is already known on this topic?

Occupational health education is one method that can increase knowledge, attitudes and practice of occupational health for HWs. It is a strategy of the prevention and control of occupational injuries and work-related health problems. However, the effectiveness of this method for HWs to learn about occupational health has yet to be the subject of extensive research.

What this study adds?

Animation is a new health education tool and suitable for occupational health training for HWs in this century, particularly for well-educated HWs. Its effectiveness is not different from conventional methods, but has flexibility, concise and allows learners to save time. It is suitable for continuous occupational health education.

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Potential conflict of interest

The authors declare no conflicts of interest.

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