



Evaluation of Disaster Preparedness Training and Disaster Drill for Nursing Students

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(Degree)

博士（保健学）

(Date of Degree)

2015-03-25

(Date of Publication)

2016-03-01

(Resource Type)

doctoral thesis

(Report Number)

甲第6315号

(URL)

<https://hdl.handle.net/20.500.14094/D1006315>

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博士論文

Evaluation of Disaster Preparedness Training and

Disaster Drill for Nursing Students

(看護学生のための災害準備性訓練及び災害ドリルの評価)

平成 27 年 01 月 19 日

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ABSTRACT

Background: Preparedness and preventive measures are needed to reduce the impact of disasters. Disaster preparedness training for nurses has a long history. However, the effectiveness of disaster preparedness training for nursing students has been limited, to some extent, since they have been based on self-evaluation.

Objective: The study attempts to evaluate the effectiveness of a disaster preparedness training program followed by a disaster drill designed for nursing students.

Participants: Participants were undergraduate students from Universitas Gadjah Mada and diploma students from four randomly chosen nursing colleges located in Yogyakarta, Indonesia. 309 students participated in the training program whereas 225 students participated in the disaster drill.

Methods: The present study conducted in-class training followed by a disaster drill and evaluated using 3 components: pre-test and post-test evaluation of knowledge (score range: 0 – 20), observation of skills during disaster drill (5-point Likert scale), and a structured one-to-one interview of participants' responses to the training and drill process.

Results: Pre-test and post-test evaluation scores showed significant improvement ($P < 0.01$, paired *t*-test) for both university and diploma students. Almost all observation items during the disaster drill were above 4.0 (on 5-point Likert scale). Interview results showed that most participants responded positively.

Conclusions: The present study completely evaluated the effectiveness of a disaster preparedness training and disaster drill: The training and drill improved the knowledge and ability of disaster preparedness for both undergraduate and diploma students.

Introduction

World Health Organization (WHO) stressed the importance of preventive measures and preparedness to reduce the impact caused by natural disasters. In the health sector, the availability of suitably equipped health providers who are able to respond when needed is considered vital. Therefore, health providers including nurses must be sufficiently knowledgeable and skillful to respond in any natural disasters. Academic institutions as a gate to the health professions incorporate disaster-related subjects within the curriculum or as a training program. However, the effectiveness of these programs has not been properly evaluated yet. It is necessary to have a comprehensive evaluation of both the effectiveness of the training and the disaster drill itself. Feedback and input from the participants could provide additional data to better design and develop curriculums for training and drills.

Purpose

The study attempts to evaluate the effectiveness of a disaster preparedness training program followed by a disaster drill designed for nursing students.

Methods

All participants in the study were undergraduate students from Universitas Gadjah Mada, and diploma students from four randomly chosen nursing colleges in Yogyakarta, Indonesia. The undergraduate students were fourth grade students who had zero experience in actual hospital practice as part of their academic program. While the diploma students were third grade students from nursing colleges who already been exposed to hospital practices for their academic program. Both undergraduate and diploma students were recruited firstly by giving them information related to this study through the teachers. Participants voluntarily agreed to participate in this study.

A-one day disaster preparedness training and a disaster drill were conducted in the study. In-class training enabled students to gain knowledge and understanding in the context of disaster preparedness. The training sessions were conducted based on a schedule that had been arranged and agreed by all institutions. Each nursing college was responsible for choosing students who participated in this training. The disaster drill stimulated participants to apply their knowledge and skills they had learned in a “real” case condition. In the disaster drill all participants worked in small groups, which gave them the opportunity to develop the sense of teamwork and collaboration needed to respond in a disaster scenario. The scenario was based on real events experienced by the authors of the 2006 earthquake in Yogyakarta. The situation and description of the environment, survivors and availability of resources were all explained in detail.

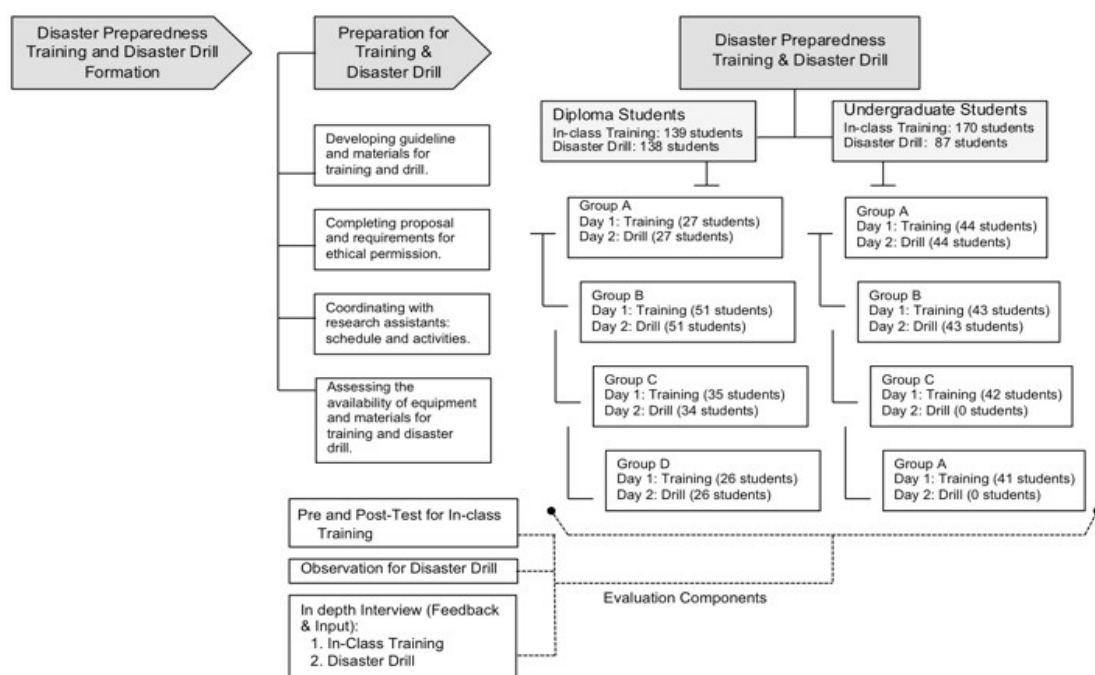


Fig 1. Study process chart

The study evaluated the effectiveness of the training and drill using 3 evaluation components: (1) Pre-test and post-test evaluation to measure the degree of knowledge

achieved in the training; (2) Observation to evaluate skills during the disaster drill; and (3) Interview to obtain participants' responses and feedbacks on both the training and drill.

Results

(1) Demographic Data

Table 2 Demographic data

Number of Participants (n, %)		In-Class Training		Disaster Drill	
		n = 309	%	n = 225*	%
Undergraduate students		170	55.02	87	38.67
Diploma students		139	44.98	138	61.33
Age (Range, Mean)		Range	Mean	Range	Mean
All participants		18 – 29	20.66	19 – 29	21
Undergraduate students		18 – 22	20.44	20 – 22	20.92
Diploma students		19 – 29	20.92	19 – 29	21.05
Sex (n, %)		n	%	n	%
Female		271	87.70	194	66.22
Male		38	12.30	31	33.78
Previous Disaster/Emergency Training Participation		n	%	n	%
Undergraduate students	With	47	27.65	28	32.18
	Without	123	72.35	59	67.82
Diploma students	With	35	25.18	34	24.64
	Without	104	74.82	104	75.36

*84 undergraduate students could not participate in disaster drill for academic schedule reason

A total of 309 nursing students participated in the disaster preparedness training, whereas only 225 students took part in the disaster drill (see Table 2). The percentage of undergraduate students was 55% of the total number of in-class training participants, but decreased to 39% of those in the disaster drill. This condition was due to the fact that the academic schedule of the university was very tight, and did not allow some students to meet the schedule of the drill.

Mean participants' age was 20 years old, whether undergraduate or diploma student for in-class training, whereas in the disaster drill it was 21 years old. In terms of gender, the majority of participants were female. More than 20% of participants had one of previous training experiences in emergency, basic life support, basic trauma life support, or disaster response as part of their curriculum or extracurricular program.

(2) Pre-Test & Post-Test Evaluation for In-Class Training

Table 3 Pre-test & post-test result

	Undergraduate Students	Diploma Students	<i>P</i>
Pre-test	9.84	10.38	0.01
Post-test	14.46	14.68	0.45
Difference	4.63	4.29	0.34

Table 4 Pre-test & post-test result categorized by institution

Institution	PreTest	PostTest	Difference
University	9.84	14.46	4.63
*A	10.65	12.19	1.54
B	11.31	12.94	1.63
C	10.14	16.25	6.12
D	9.37	16.33	6.96

*A – D refer to 4 randomly chosen nursing colleges in Yogyakarta, Indonesia

The mean pre-test scores for undergraduate students and diploma students were 9.84 and 10.38, respectively ($P=0.001$, t -test) (see Table 3 and table 4). However, the mean post-test scores were not significantly different between the two groups. This caused a slightly higher mean difference (D) score in undergraduate students (4.63) in comparison to diploma students (4.29), whereas the scores were significantly improved in both groups ($P<0.001$ for both, Paired t -test). The study found that diploma students, without previous training experience, have a significantly higher difference score (4.90) than groups who have previous training experience (3.30) ($P<0.001$, t -test) (Figure 3).

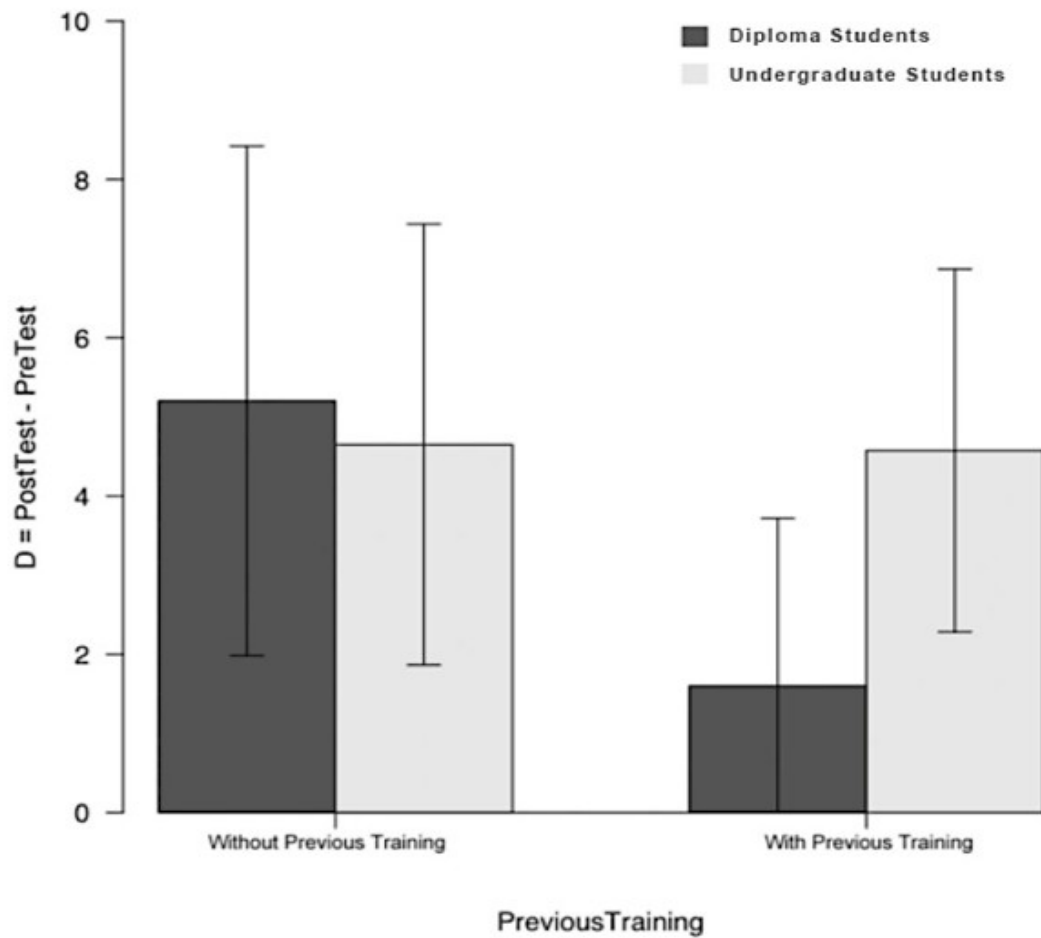


Figure 3. *t*-test analysis of difference score in relation to training experience

(3) Observation Data of Disaster Drill

For the 225 participants, a mean score of 4.39 was reported for the ability to work with other team members (Obs.4), mean score of 4.10, for the ability to transport survivors safely to the nearest health facility (Obs.3), mean score of 4.05 for the ability to do initial treatment (Obs.2) and the lowest reported mean score of 3.70 for the ability to do triage and identify health problems (Obs.1). The results of the observations are presented in Table 5. Mean scores for Obs.1 and Obs.4 in undergraduate students were 4.38 and 4.87, which were significantly higher than diploma students 3.28 and 4.09 respectively. Whereas mean scores for Obs.2 and Obs.3, were almost the same for both

undergraduate students (4.13 and 4.24, respectively) and diploma students 4.00 for both items.

Table 5 Observation result

Observation Items	All Participants (n = 225), SD	Diploma Students (n = 138), SD	Undergraduate Students (n = 87), SD
Obs.1. The ability to do the triage and to identify the survivors' health problems in disaster situation.	3.7 (0.71)	3.28 (0.45)	4.38 (0.49)
Obs.2. The ability to do the initial treatment for survivors.	4.05 (0.51)	4.00 (0.43)	4.13 (0.61)
Obs.3. The ability to transport survivors safely from the field to the nearest health facility.	4.10 (0.43)	4.00 (0.08)	4.24 (0.67)
Obs.4. The ability to work with other members.	4.39 (0.82)	4.09 (0.89)	4.87 (0.34)

5 point likert scale (5 = very proficient)

In order to find out the factors that could significantly influence the observation result (Obs.1, Obs.2, Obs.3, and Obs.4) among groups, we analyzed all possible factors including strata of students (undergraduate or diploma), post-test score (lowest and highest among each group), post-test mean of each group, mean difference of score (D) for each group, and training experience using stepwise linear regression analysis. We found that several factors were significantly correlated with Obs.1 and Obs.4 (see Table 6 and Table 7). The most influential factor correlated with these two evaluation items, was the difference level of undergraduate or diploma. For Obs.4, post-test score negatively influenced the result. It showed that participants with lower post-test scores had higher difference scores.

Table 6 Stepwise linear regression analysis result for Obs.1

Variable	β^*	Standard Error	T value	P
Mean difference	0.21	0.07	2.88	0.01
Previous training experience	0.01	0.004	2.58	0.02

Adj-R²

*Standardized partial regression coefficient

Table 7 Stepwise linear regression analysis result for Obs.4

Variable	β^*	Standard Error	T value	P
Mean difference	0.36	0.09	3.67	0.002
Post-test score	- 0.39	0.14	- 2.85	0.01

Adj-R²

*Standardized partial regression coefficient

(4) Interview Results

One of the authors (SA) conducted focused coding and analyzed all data collected from interview. Table 8 shows the extent to which participants responded positively to statements related to benefits and advantages of training and disaster drill. The response by most of the participants (73%) can be summarized as “I could understand what to do in disaster situations or emergency conditions”. Whereas only some participants (27.5%) can be summarized as “I can have benefit to support my academic class”.

Table 8 Interview result

	n=40, %
I. Benefits and Advantages of Training and Disaster Drill:	
1. I could understand what to do in disaster or emergency situations	75
2. I could improve my knowledge in disaster response	60
3. It could support my academic class	27.5
4. I think this training had an advantage for practical session (disaster drill)	65
II. Evaluation of Content and Process	
1. The training materials were interesting	75
2. The training materials were up to date	80
3. I think the time for training and drill were limited	83
4. The trainers and instructors were clear and easy to understand	83
5. I think the drill should have more cases	20

Related to the evaluation of content and process, the response from most participants can be summarized, as “the training and disaster drill materials were interesting and up

to date” (80%); and “there was limited time for disaster drill and training” (83%). With regard to instructors, most participants’ response (83%) can be summarized as “the trainers and instructors were clear and easy to understand”. Participants’ response in the drill (20%) can be summarized as “the drill should have more of cases added to the scenario”.

Discussions

The effectiveness of the present study was demonstrated by the result of three components: pre-test and post-test, observation during disaster drill, and interview.

1. Pre-test and post-test

In the present study we used pre-test and post-test evaluations to assess knowledge achievement after completing the in-class disaster preparedness training. However, the value of the pre-test and post-test evaluation tends to be influenced by many external factors, including the Hawthorne effect, the halo effect and the practice effect. The Hawthorne effect refers to the phenomenon of altered behavior or performance resulting from awareness of being a part of an experimental study (Campbell et al., 1995), the halo effect is defined as the tendency to let the assessment of an individual on one trait, influence evaluation of that person on other specific traits (Darby, 2007), and the practice effect is a phenomenon where the performance of a person is influenced by the learning that results from repeated exposure to the testing materials (Beglinger et al., 2005). In order to provide accurate pre-test and post-test results without the influence of the halo effect, the present study used an anonymous-unique code number for every participant’s evaluation result.

The first evaluation of the pre-test and post-test results, showed that participants’ mean

different score (D) was positive in both undergraduate and diploma students. This result means that the participants gained a better understanding of disaster preparedness after completing the training. In measuring the effectiveness of training, Palameta et al. described that “an effective training can be defined as one which is designed and delivered in a way that is well aligned with the learning needs of its target population such that it enables participation and produces relevant knowledge and skill gains.” (Palameta et al., 2011, p.2) In this sense, our study proved to be effective.

The findings also confirmed that the mean difference score in pre-test and post-test evaluation for undergraduate student was slightly higher than diploma students. The other finding revealed that the group with previous training experience had on average a lower difference score than those without, in diploma students. This finding raised an issue related to the benefits of previous training. Whereas the group with previous training experience was expected to have a better result in evaluation in this instance it didn't. The possible reason might be that most diploma students have previous training experience in a specific subject related to emergency response rather than disaster preparedness. The other reason is that in diploma students the group with previous training on the average already achieved higher pre-test scores than those without, so that there was a small possibility of gaining further increased scores.

2. Observation during disaster drill

The second variable demonstrating the effectiveness of the study was based on observations during the disaster drill to evaluate the ability to respond in a disaster event.

Consistent with the findings in the pre-test and post-test evaluation, the mean score was higher for undergraduate students than those for diploma students (Table 5).

The findings proved that most students were able to respond to the scenarios of disaster drill and able to perform procedures, starting from conducting of triage, to identifying health problems, performing initial treatment and transporting patients safely to the healthcare facility. Previous studies have suggested that conducting disaster drills for nursing students is essential for building capacity in the early stage of professional education. It could serve as a means for students to gain experience, develop concrete ideas and know what to do in dealing with catastrophic situations (Kako et al., 2012).

All participants scored higher than average in relation to teamwork. In their study of the use of simulation for training teamwork skills in health care, Beaubien & Baker (2004) defined teamwork as behaviors such as dynamic interaction, having a shared past, having a foreseeable shared future, and sharing common fate that facilitates effective team member interaction. Furthermore, in order to achieve an effective result from teamwork, each member must possess teamwork competency components such as knowledge, skills, and attitudes. Teamwork knowledge refers to factual information that the team members must possess, such as information about the mission, or information about the roles and responsibilities of individual team members. Teamwork skills refer to the learned capacity to perform some type of task, such as being able to communicate clearly, concisely, and using the proper phraseology. Teamwork attitudes refer to mental states that influence the team members to behave in a particular way.

Teamwork effectiveness seemed to be achieved by the process of gaining new knowledge in the training session and could be directly put into action in the disaster drill. Participants could also play particular roles within a group during the drill. The findings were also consistent with the study from Kaplan et al. (2012) who investigated the use of emergency preparedness disaster drills on undergraduate nursing students.

The study found that the majority of participants (95%) stated, “agreed” and “strongly agreed” that the drill increased knowledge and confidence in dealing with emergency preparedness situations and in working within a team.

3. Structured one-to-one interview

The effectiveness of the present study was also evaluated based on the results of the interview with 40 participants. Most participants responded positively, that this training and drill improved knowledge and skills of disaster preparedness. They felt that they could understand and do actions to respond in disaster situations. The study from Kaplan et al. (2012) also found that most participants commented positively on the emergency preparedness disaster drill. Another study conducted by Ireland et al. (2006) in integrating disaster preparedness into a community health nursing course found that by participating in a mock drill, nursing students were given the opportunity to apply the learning and to develop additional skills required to respond to a variety of threats. The students also commented that the program had been helpful in developing understanding and experiencing the nature of catastrophic events.

Limitation of Study

Our study has several limitations. First, our in-class training program was designed as a one day eight hour course. This was a very limited time to cover all the subjects required in disaster preparedness training along with pre-test and post-test evaluation. Second, the concurrent schedule of regular academic studies made it impossible for some undergraduate students to participate in the disaster drill. Third, the present study was able to assess short-term achievement of knowledge and skills, but was unable to evaluate long-term knowledge and skill retention.

Conclusions

The study successfully evaluated the effectiveness of the disaster preparedness training and disaster drill: The program improved the ability of disaster preparedness in nursing students, both undergraduate and diploma students; the extent of improvement depended on previous experience of training. Further studies are needed to develop more extensive training curricula and design for disaster preparedness, as well as specific evaluation of post-training for both the short term and the long term.