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Does compulsory training improve occupational safety and health implementation? The case of Malaysian

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ABSTRACT

The objective of this article was to investigate the effectiveness of occupational safety and health's (OSH) compulsory training since it has never been addressed before. Although previous researchers find that OSH training is very important as an intervention to create safety climate; however, some researchers find that compulsory training is ineffective as compared to optional training. Hence, findings of this current research offers original contribution by determining whether OSH's compulsory training could stimulate OSH implementation using a quasi-experimental design. An amount of 287 Malaysian participants attended 21 OSH's compulsory training organized by the Malaysian's National Institute of Occupational Safety and Health (NIOSH) in 2015 was taken for sample. A paired sample t-test indicates a significant implementation of OSH among respondents. In fact, 88.5% respondents passed learning examination at the end of training and majority or 98.3% respondents used what they learned in training at their respective workplaces after training completion. Additionally, using independent sample t-test, it is indicated that there is no significant different between respondents that felt they are mandated and voluntary to attend the OSH's compulsory training. Hence, it is verified that compulsory training could also be effective; in which, the NIOSH's compulsory training had stimulate OSH implementation among the Malaysian. Implications for future research and practice were also discussed.

1. Introduction

Safety training is very important as a part of safety climate (Ajslev et al., 2017; Christian et al., 2009); this is why most of countries around the globe, such as Malaysia required their people to attend safety training especially for those holding high risk hazard occupations. Unfortunately, some of research findings including by Tharenou (2001), Curado et al. (2015), and Aziz and Selamat (2016) reported that compulsory training would not be as effective as optional training. Since, this issue was not addressed using sample from trainees that attended safety training; there is a need to determine the effect of compulsory safety training on training effectiveness. In fact, this issue is significant to be investigated because it would determine whether safety training should be mandated because of its importance; otherwise, alternative intervention should be considered if compulsory safety training is ineffective.

For example, Ngah et al. (2016) reported that the number of occupational accidents and injuries in Malaysia have increased by years. Ironically, the government has been initiating occupational safety and

health (OSH) implementation through laws and regulations. For instance, under the Malaysian Occupational Safety and Health Act/OSHA (1994) revised in 2006, a list of job tasks that is dealing with high risk hazard is mandated to obtain certificate of practice by the Malaysian Department of Occupational Safety and Health (DOSH). This means that those employees involved should attend compulsory training organized by the Malaysian's National Institute of Occupational Safety and Health (NIOSH) or other training organizations that approved by DOSH in order to get the certificate of practice.

Nevertheless, there are some employers that still unconvinced about the importance of OSH's compulsory training. For example, Ilham (2016) reported that a Malaysian contractor is dead after inhaling methane gas when cleaning a tank at PETRONAS plant in Kertih, Terengganu. The incident demonstrates the lack of specific knowledge and skills to prevent occupational accidents; it also provides lesson for employers and top management to be aware of complying the government's laws and rules especially to provide OSH's compulsory training for employees. Unfortunately, some researchers, such as Curado et al. (2015) found that compulsory training is ineffective as

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compared to optional training. Hence, there is a need to determine whether OSH's compulsory training is effective to improve safety performance since previous researches have neglected this issue. Therefore, the purpose of this current research is to investigate the effectiveness of OSH's compulsory training organized by the Malaysian's NIOSH; in which, training effectiveness is measured through learning performance and training transfer.

Findings of this research would be significant because it should guide the government and upper management to decide whether safety training should be mandated. Since previous researches, including [Grau et al. \(2002\)](#), [Holte and Kjestveit \(2012\)](#), and [Ricci et al. \(2016\)](#) reported that safety training would usually be effective because of the needs in controlling occupational accidents; findings of the current research should also verify their research findings. In fact, findings of the current research would be useful for future research questions including the determinations of the needs of implementing periodic safety training, the needs of providing safety training climate, the precise time to evaluate training transfer, and the needs to clarifying characteristic of effective safety training. However, these future research questions would only be relevant if it is verified that compulsory safety training is effective.

Therefore, to achieve the purpose of this current research, the organization of this paper is presented by discussing the literature review related to the role of training in safety and health intervention, followed by research method, findings and discussion, practical implication, and conclusion.

1.1. Literature review of the role of training in occupational safety and health intervention

Occupational safety and health (OSH) literature shows that occupational accidents and injuries could be controlled by providing positive safety climate; one of the climates is to equip employees with related OSH training. However, some researchers find that compulsory training is ineffective as compared to optional training. Hence, there is a need to determine whether OSH's compulsory training is effective using a more rigid study, as well as to determine the impact of OSH's training implementation.

From organizational and industrial psychology perspective, [Hofmann et al. \(2017\)](#) explain that the literature in OSH begins with factory laws, basic worker compensation, and accident proneness; then, the literature move on focusing OSH training, and currently focusing on organizational climate and leadership. This is consistent with recent researches; for example, [Mullen et al. \(2017\)](#) reported the importance of leadership and [Ajslev et al. \(2017\)](#) reported the importance of safety climate for OSH implementation. This is also consistent with OSH model suggested by [Christian et al. \(2009\)](#) as shown in [Fig. 1](#). The model explains that occupational accidents and injuries could be controlled by providing suitable OSH climate; OSH climate is not only to stimulate positive OSH environment but also to provide employees with the right knowledge and motivation in improving safety compliance and participation. One of most important safety climate is to provide compulsory training to stimulate OSH implementation.

Further, from human resource development perspective, training effectiveness is defined as the achievement of training objectives; in which, it would benefits employee, employers, and the organization ([Tai, 2006](#); [Noe, 2017](#)). Training effectiveness evaluation model by [Kirkpatrick \(1959, 1996\)](#) suggests that training effectiveness could be evaluated by determining the four levels of training evaluation including positive reaction from participants, followed by learning performance, behaviour (or training transfer), and results on organizational performance. However, if using [Kirkpatrick's \(1959, 1996\)](#) model to evaluate the four levels completely, it would increase the use of time, costs, commitment, and expertise to determine training effectiveness ([Giangreco et al., 2010](#)). Hence, numerous scholars including [Arthur et al. \(2003\)](#), [Laberge et al. \(2014\)](#), and [Noe \(2017\)](#) have demonstrated

the importance of measuring learning performance and training transfer to determine the status of training effectiveness.

Learning performance and training transfer are significant measurement to determine training effectiveness because the main purpose of providing employee training is to increase employees' knowledge, skills, and attitudes and finally use it to improve job performance ([Kirkpatrick, 1996](#); [Noe, 2017](#)). In fact, by determining training effectiveness from learning performance and training transfer perspectives, it is more convincing that what was transferred to the workplace is actually what was learned from training and not from other sources ([Kirkpatrick, 1996](#); [Noe, 2017](#)). Hence, to determine learning performance, most of previous researchers including [Tziner et al. \(2007\)](#), and [Steensma and Groeneveld \(2010\)](#) use learning test. Meanwhile, [Namian et al. \(2016\)](#) and [Zumrah \(2015\)](#) use self-perception to determine training transfer among participants. Ironically, [Namian et al. \(2016\)](#) did not validate self-perception of training transfer from participants' supervisor because it is believed that data from participants' supervisor would be bias as supervisor represents the organization's image and reputation. Hence, it is more convincing to determine participants' learning performance through examination/test, and their training transfer through self-perception.

On the other hand, a number of researchers have been proving the effectiveness of OSH training. For example, [Grau et al. \(2002\)](#) use a quantitative method, [Holte and Kjestveit \(2012\)](#) use a qualitative method, and [Ricci et al. \(2016\)](#) use a meta-analysis involving studies published from ten databases in between 2007 and 2014. These researchers find that OSH training has significantly improved employees' knowledge, skills, and attitudes towards OSH implementation. However, [Hofmann et al. \(2017\)](#) suggest future researchers to use a more rigid study to determine OSH's training effectiveness. This demonstrates that findings from a quasi-experimental approach could be valuable in proving the effectiveness of OSH training especially when it is blended with longitudinal study. Interestingly, previous studies have neglected to report whether those effective OSH training taken for sample were compulsory or optional.

Compulsory training means that employee is mandated to attend training; meanwhile, optional training means that employee have choice to decide whether they want to attend the training ([Baldwin et al. 1991](#); [Aziz and Selamat, 2016](#)). Using training with various objectives, [Tharenou \(2001\)](#) focus on the Australian sample, [Curado et al. \(2015\)](#) focus on the Portuguese sample, and [Aziz and Selamat \(2016\)](#) focus on the Malaysian sample; these researchers have proven that compulsory training is ineffective as compared to optional training. However, [Tsai and Tai \(2003\)](#) use Taiwanese sample that participated in courses related to banking and financial laws but find the other way round. Curiously, the effect of option to attend training (either compulsory or voluntary) on OSH's training effectiveness has not been addressed previously.

Furthermore, the determination of OSH's compulsory training effectiveness is crucial because it will affect future decision about OSH training. For example, from the management of OSH perspective, [Khanzode et al. \(2012\)](#) explain that each time an accident occur in an organisation, the management will come out with a query about possible factors that caused the accident and alternatives to prevent the accidents. Hence, if organisation climate was already taken into consideration, a query should be pointed whether training should be given as compulsory in periodic time to increase OSH awareness. In fact, [López-Arquillos, et al. \(2015\)](#) find that most of syllabus of engineering courses emphasized about prevention through design in organisation setting; however, OSH training to implement it did not really given for those employees that should exercise it. Hence, the level of knowledge, skill and attitude about prevention through design should be assessed to determine OSH's compulsory training needs. Additionally, [Schwarz et al. \(2016\)](#) find that managers tend to present the organisation's positive attitude towards OSH; hence, leadership training should emphasize on OSH's importance as a compulsory.

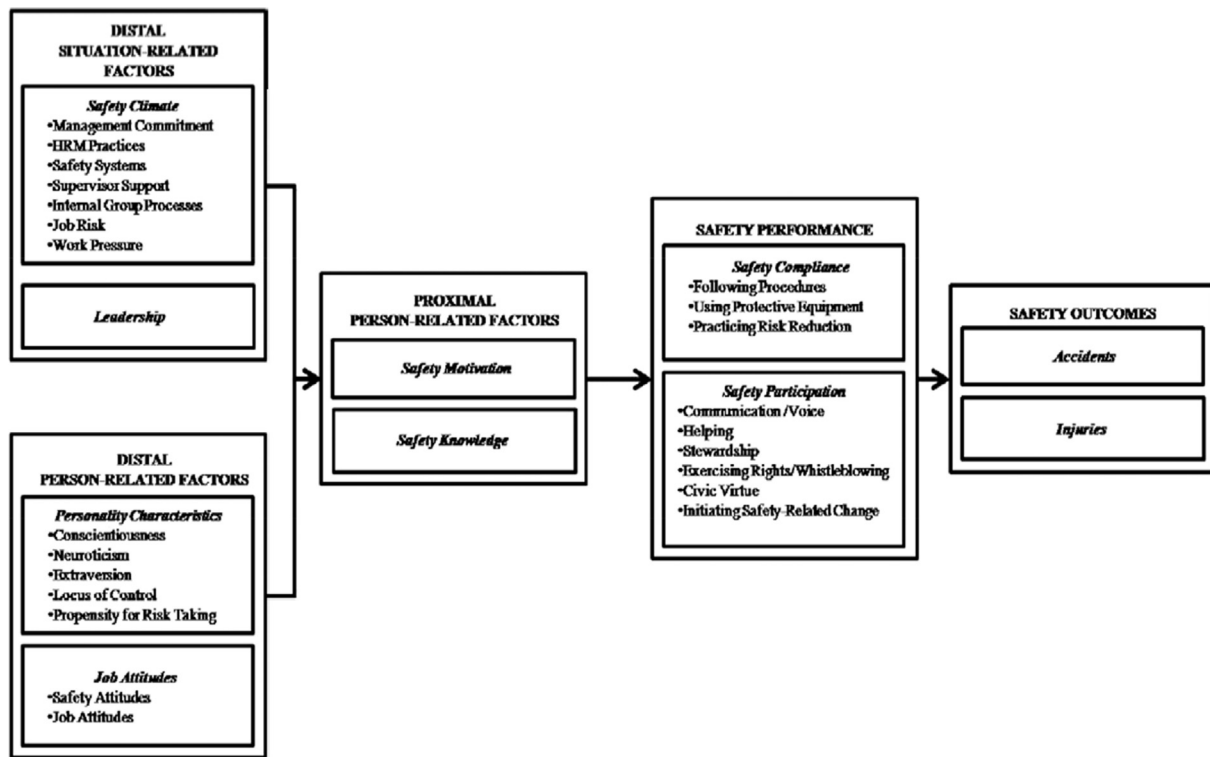


Fig. 1. An Integrative Model of Workplace Safety. Source: Christian et al. (2009, p. 1105).

Therefore, the objective of this current research is to determine whether OSH's compulsory training is effective to improve OSH implementation since most of OSH training is compulsory. To achieve the research objective, training effectiveness would be measured using learning performance and training transfer evaluation. In addition, a quantitative method involving quasi-experiment study that blended with longitudinal approach would be used to achieve the research objective. Further, learning performance would be reported using secondary data; training transfer would be reported using quasi-experiment among trainees attended OSH training organized by NIOSH, Malaysia. Additionally, the time frame that participants used to transfer their skills learned in training would also be identified.

2. Methods

2.1. Respondents

Respondents were selected among the Malaysian participants attended 21 compulsory training organized by the Malaysian NIOSH in 2015; these participants came from various working organizations and provinces throughout Malaysia. Using census, all the 309 participants were involved as respondents; however, only 92.88% return rate or 287 participants were selected because they were willing to involve in post-data collection and these data were also useable and free from outliers. Although the OSH training is compulsory to get certificate of practice by DOSH, not all the participants felt that they were forced to attend the training. Out of 287 participants, 233 participants felt that they are mandated to attend the training and 54 participants felt that they are voluntary to attend the OSH training. Hence, Table 1 shows the proportion of respondents based on specific training and the assumption to attend training.

2.2. Learning performance

To determine learning performance, secondary data of examination results were used. The NIOSH has set up an examination at the end of

each training program; in which, training participants should pass the exam if they want the certificate of practice from DOSH. These examinations were well designed, developed and validated by NIOSH. To determine learning performance, a combination of paper and pencil test and practical test was given at the end of training. Questions asked in these examinations are based on each training objectives and contents.

Participants have to sit for a paper and pencil test to determine the level of cognitive achievement based on the training content. The test consists of objective, subjective and essay sections and contributes 50% of learning performance achievement. Another 50% achievement of learning performance was determined using practical test. During practical test, training participants should rehearse what they learned in training especially the OSH procedures that could be shown by psychomotor skills. The practical test consists of practical assignment and OSH procedures to determine participants' OSH skill achievement.

Training participants were assessed as passed if they achieve more than 70% in this examination (paper and pencil test, and practical test). However, if they failed, they would need to re-attend the training to sit and pass the examination. Since NIOSH's examination is confidential, only general results would be discussed in this article.

2.3. Training transfer

To determine training transfer, a quasi-experiment and longitudinal approach were used. In quasi-experiment, respondents need to answer a questionnaire using two times in longitudinal study; this is referred as pre- and post-training data. For pre-training data, respondents need to answer the questionnaire before training started; for post-training data, respondents were contacted using e-mails and phone calls to answer the same questionnaire in between three to six months after the completion of training. Then, a paired sample t-test was used to determine the status of training transfer by analysing whether there is a significant change in OSH implementation. Additionally, the comparison between training participants that felt they are mandated and voluntary to attend the training was also analysed using independent sample t-test.

Instrument developed by Zacharatos (2001) was used as the

Table 1
Proportion of respondents based on training program and assumption to attend training.

Num.	Training Name and Date	Number of participant based on assumption to attend training		Number of participant	Percentage (%)
		Mandated	Voluntary		
1	AESP 13-14/4/2015	12	6	18	6.3
2	WAH 13-14/4/2015	9	3	13	4.5
3	AGTES 13-15/4/2015	10	5	15	5.2
4	SHFT 14-16/4/2015	4	6	13	4.5
5	WAH 15-16/4/2015	10	4	14	4.9
6	AESP 15-16/4/2015	16	1	17	5.9
7	AESP (R) 17/4/2015	14	0	14	4.9
8	AESP 18-19/4/2015	15	1	16	5.6
9	AGTES 20-22/4/2015	9	1	10	3.5
10	SHFT (R) 21/4/2015	7	2	10	3.5
11	AGTES (R) 21/4/2015	13	1	14	4.9
12	AESP 25/4/2015	10	2	12	4.2
13	AESP 27-28/4/2015	15	0	15	5.2
14	AGTES 27/4/2015	7	1	11	3.8
15	AGTES (R) 29-30/4/2015	8	0	8	2.8
16	AGTES 5-7/5/2015	9	0	10	3.5
17	AESP 6-7/5/2015	14	2	16	5.6
18	AESP 11-12/5/2015	12	0	13	4.5
19	AGTES 11-13/5/2015	12	0	12	4.2
20	AESP 13-14/5/2015	17	5	22	7.7
21	SHFT 13-15/5/2015	10	4	14	4.9
	Total	233	54	287	100

*Notes: AESP = Authorized Entrant and Standby Person for Confined Space; WAH = Working Safely at Height; AGTES = Authorized Gas Tester and Entry Supervisor for Confined Space; SHFT = Safe Handling of Forklift Truck.

questionnaire to measure OSH implementation. The instrument was adapted into 10 positive items and translated using back translation method into Malay language. Previously, a pilot study involving 33 participants attending NIOSH's training at the early of 2015 was done to determine the instrument reliability; result indicated high reliability with Alpha Cronbach 0.86. There are two dimensions of safety implementation in this questionnaire including five items for safety compliance (adapted from seven items in original questionnaire) and five items for safety initiative (adapted from eight items in original questionnaire). Sample item for safety compliance was "I use all necessary safety equipment to do my job". Meanwhile, sample item for safety initiative was "If I think an action would make work safer, I initiate the action to improve work procedures". Respondents need to answer each item using 5 point of Likert scales stating their frequentness to comply the OSH implementation. In this case, 1 point illustrates for "Never", 2 point for "Rarely", 3 point for "Sometimes", 4 point for "Often", and 5 point is illustrated for "Very often" to implement OSH.

In addition, respondents were also asked to determine whether they have used what they learned in OSH training at their respective workplaces. For this question, they have to answer the time frame they have been using OSH's knowledge, skills and attitude learned in training at their respective workplaces. They need to choose whether they have been using it exactly after the completion of training, or approximately one week, one month, within three months, more than three months, or did not used it at all.

3. Findings and discussion

Findings showed that OSH's compulsory training is effective instead of different assumption to attend training. Majority of respondents passed the learning examination and used what they learned in training at their respective workplaces. This is also verified by the results of quasi-experimental study.

3.1. Occupational safety and health's compulsory training effectiveness based on learning performance

For learning performance, findings indicated that 88.5% (254 from

287 respondents) or majority of respondents passed exam at the end of OSH training. This is consistent with previous research that indicated training could stimulate OSH's learning especially to increase the participant's knowledge, skill and attitude. For example, [Grau et al. \(2002\)](#) found that OSH training could improve employees' self-efficacy and safety attitude in Spanish companies. Meanwhile, [Holte and Kjestveit \(2012\)](#) found that OSH training could improve employees' knowledge, skills, and attitudes on OSH implementation in Norway companies. Moreover, [Ricci et al. \(2016\)](#) validated these findings through a meta-analysis research. Hence, by using the Malaysian sample, the current research also validated findings from previous research that indicated OSH training could improve employees' knowledge, skills, and attitudes.

3.2. Occupational safety and health's compulsory training effectiveness based on training transfer

Further, findings indicated that OSH training provided by NIOSH was successfully transferred to the workplace. This is based on verification from respondents after three to six months of training completion; results are shown in [Fig. 2](#). Findings indicated that majority or 98.3% respondents have transferred what they learned in training at their respective workplaces. Interestingly, 34.8% respondents transferred the learned skills as soon as training completion and 46% respondents transferred the skills learned approximately one month after training completion. Interestingly, [Kirkpatrick \(1959; 1996\)](#) suggests that training should be evaluated at least three months after training completion; some researchers, such as [Chiaburu and Tekleab \(2005\)](#) evaluated it two months after training completion. Since most of previous researches have neglected to report the precise time to evaluate training transfer, findings could be useful for future researchers; in this case, majority of trainees would transfer their learned skills approximately one month after training completion.

Further, [Table 2](#) presents the results of quasi-experimental study using paired sample t-test to verify training transfer. Findings show that there is a significant increase in OSH implementation from the time before training ($M = 3.560$, $SD = 0.5690$) to after three to six months of training completion [$M = 4.421$, $SD = 0.3685$, $t(286) = 26.914$,

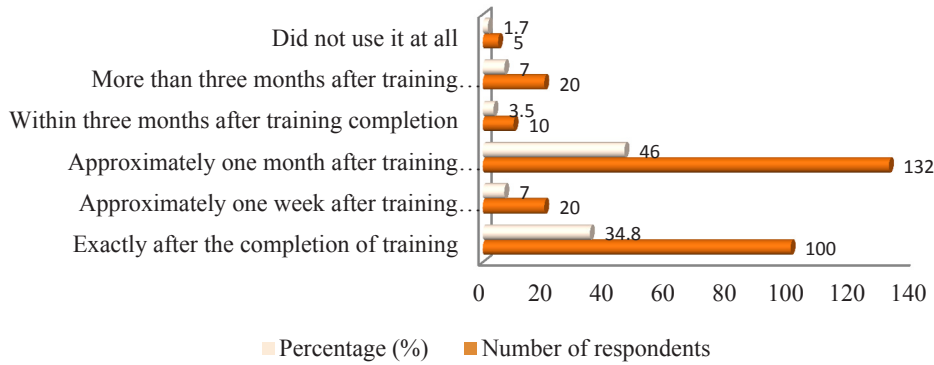


Fig. 2. Time frame of training transfer among respondents.

Table 2

Paired sample test for OSH implementation as measured before and after the completion of OSH training.

Comparison	N	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1 Mandated participants	233	0.8660	0.5456	0.0357	0.7956	0.9364	24.228	232	0.000
Pair 2 Voluntary participants	54	0.8366	0.5285	0.0719	0.6924	0.9809	11.633	53	0.000
Pair 2 Total participants	287	0.8605	0.5416	0.0319	0.7975	0.9234	26.914	286	0.000

$p < .0001$]. The eta squared statistic (0.7176) indicated a large effect size. This means that OSH training has large effect to improve OSH implementation among respondents. Additionally, there is also a significant increase in OSH implementation for both participants that felt they are mandated to attend the OSH training [$t(232) = 24.228$, $p < 0.0001$] and participants that felt they are voluntary to attend the OSH training [$t(53) = 11.633$, $p < 0.0001$]. Fig. 3 illustrates the significant increase between the mean score of each item asked about OSH implementation among respondents.

Meanwhile, Table 3 presents the results of quasi-experimental study using independent sample t-test to compare the mean score of OSH implementation after training completion between training participants that felt they are mandated and voluntary to attend the OSH training. Findings show that there is no significant different between both groups [$t(285) = -1.118$, $p < 0.265$]. Additionally, Fig. 4 illustrates the mean score based on each item asked about OSH implementation between training participants that felt they are mandated and voluntary to attend the training. This implies that OSH's compulsory training is effective whether training participants felt they are mandated or voluntary to attend the training.

Findings are consistent with previous research although previous researchers have been using different methods and samples to determine the OSH's training transfer. For example, Grau et al. (2002)

used survey and found that OSH training could improve safety behaviour in Spanish companies. Meanwhile, Holte and Kjestveit (2012) used qualitative study and found that OSH's training transfer have decreased occupational accidents and injuries in Norway companies. Moreover, Ricci et al. (2016) validated these findings through a meta-analysis research. Hence, by using the Malaysian sample, the current research also validated findings from previous research by using a quasi-experimental design; findings also indicated OSH training could be transferred to improve OSH performance in Malaysia.

Furthermore, findings also validated that OSH training could be effective although it is compulsory; this is consistent with research by Tsai and Tai (2003). However, some researchers, including Tharenou (2001) and Curado et al. (2015) found the other way round. The inconsistency could be explained by Baldwin's et al. (1991) research; in which, the research found that trainees that are willing and accept to attend training would increase their training motivation and effectiveness although the training is compulsory. Perhaps, respondents involved in the current research are willing to attend the OSH training although it is compulsory. Hence, the current research verifies that compulsory training could also be effective regardless the sample; however, several interventions could be done to increase employees' willingness to attend training.

For example, Aziz and Ahmad (2011) have suggested several

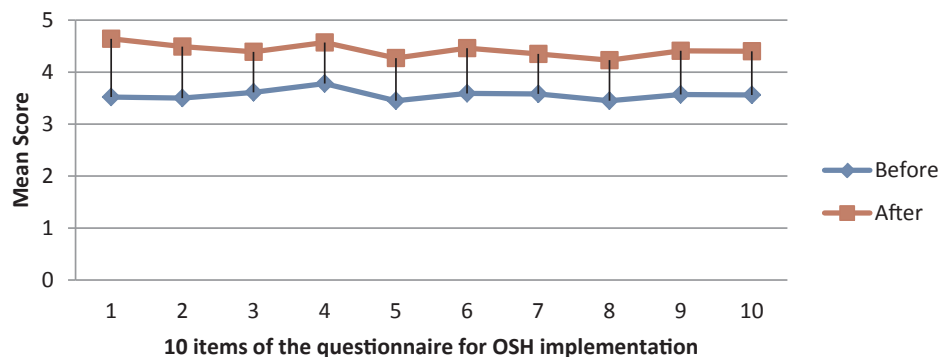


Fig. 3. Mean score comparison for OSH implementation between before and after three to six months of training completion. *Notes: See Appendix for details of 10 items.

Table 3
Independent sample test for OSH implementation between mandated and voluntary participant o attend OSH training.

Comparison	N	Mean		Levene's Test for Equality of Variances		t	df	Sig. (2-tailed)	
				F	Sig.				
Pair 1	Mandated	233	4.4093	Equal variances assumed	1.757	0.186	-1.118	285	0.265
	Voluntary	54	4.4715						

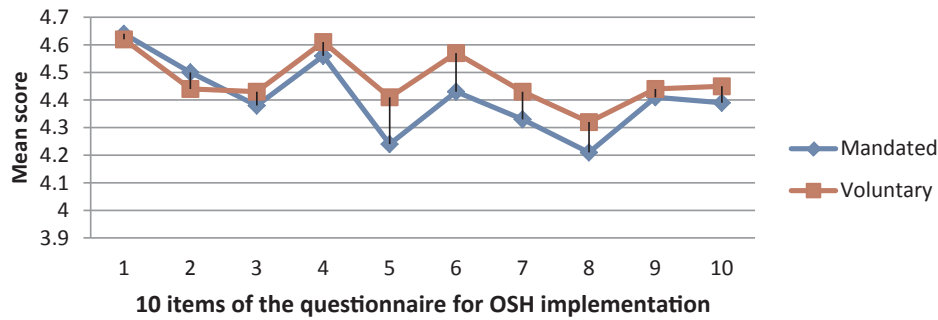


Fig. 4. Mean score comparison for OSH implementation between training participants that felt they are mandated and voluntary to attend training. *Notes: See Appendix for details of 10 items.

approaches to increase employees’ willingness and motivation to attend training, such as to make sure that OSH training is organized by reputable organization, designed very well, and relevant with employees’ job, career and personal needs. Additionally, [Towler et al. \(2014\)](#) suggest that supervisor should communicate the benefits of training to their subordinates to stimulate employees’ willingness to attend training.

4. Practical implications

The research demonstrates several implications. First, research found that OSH’s compulsory training was effective probably because respondents were willing and motivated to attend it although it is compulsory; hence, human resource practitioners should give priority for those employees that are willing to attend training to ensure training effectiveness. Meanwhile, future researchers especially the industrial and organizational psychologists are suggested to determine whether the willingness to attend OSH training is really the main factor affecting the effectiveness of compulsory training; if it is verified, factors affecting employees’ willingness to attend OSH training should also be investigated.

Secondly, research found that OSH’s compulsory training was effective because it provides employees with OSH’s knowledge, skills, and attitudes; hence, human resource practitioners should test and maintain the level of OSH’s knowledge, skills, and attitudes among employees to prevent occupational accidents. Meanwhile, future researchers especially the human resource development researchers are suggested to determine how long employees could retain their OSH’s knowledge, skills, and attitudes learned in training; if there is time frame, future research should investigate the needs of organizing periodic OSH training in preventing occupational accidents.

Thirdly, research found that OSH’s compulsory training was effective because respondents have successfully transferred what they learned in training; hence, human resource practitioners should provide OSH training to prevent occupational accidents although it is not compulsory. In addition, future researchers are suggested to investigate organizational climate that could support the training transfer for safety training. Some researchers have investigated organizational climate to support training transfer; for example, [Kontoghiorghes \(2004\)](#) focused on training transfer climate, and [Ajslev et al. \(2017\)](#) focused on organizational safety climate. However, research focusing organizational

climate that support training transfer for OSH training has not been addressed and need to be investigated. For example, [Aziz \(2018\)](#) has discussed several characteristics that support training effectiveness including trainee, training and organizational characteristic; these can be used to study the organizational climate that support OSH training.

Fourthly, research findings also revealed that trainees in OSH training usually transfer their learned knowledge and skills approximately one month after training completion at their respective work places. Hence, this information could be used to evaluate OSH’s training transfer by safety officer in each organization; OSH’s training transfer should be evaluated at least one month after training completion. In addition, this information is also useful for future researchers, since previous researchers have neglected to report the right time to measure training transfer.

Finally, research found that OSH’s compulsory training provided by NIOSH Malaysia was effective because NIOSH has systematically planned, developed, and organized those training; hence, future researcher should investigate the characteristic of effective OSH training using a meta-analysis technique since there are numerous researches proposing selective characteristic of effective training. For example, [Aziz and Selamat \(2016\)](#) found that some characteristics of training that could guarantee training effectiveness are the relevant of training for employees, familiarity of training content, reputation of training in terms of quality and training provider, and training design. Further, [Namian et al. \(2016\)](#) found that OSH training should be high engagement; [Ashrafi et al. \(2016\)](#) found that training design that incorporates the uses of information technology is more effective. Meanwhile, [Labege et al. \(2014\)](#) found that OSH training should involves ergonomic work simulation that could imitate the actual work condition especially to train younger employees. Additionally, [Lee \(2010\)](#) found that blended training that combines multiple methods of training and computer technology is more effective for training design.

5. Conclusions

The purpose of this research was to determine whether OSH’s compulsory training organized by the Malaysian’s NIOSH is effective. This is because previous researchers found that OSH training is very important as an intervention to create safety climate; however, some researchers found that compulsory training is ineffective as compared to optional training. Since the effectiveness of OSH’s compulsory

training has never been addressed, findings of this research offers original contribution by determining whether it could stimulate OSH implementation using a quasi-experimental design. An amount of 287 respondents attended 21 OSH's compulsory training organized by the Malaysian's NIOSH in 2015 was taken for sample. Findings indicated that those compulsory training were effective; in which, respondents' level of OSH implementation has significantly increased at the time before training started to at least one month after the completion of training. Additionally, there is no significant different between respondent that felt that they are mandated and voluntary to attend the training. In fact, 88.5% respondents passed learning examination at the end of training and majority or 98.3% respondents used what they learned in training at their respective workplaces. Hence, it could be concluded that compulsory training could also be effective; in which, the NIOSH's training had stimulate OSH's learning among respondents and were successfully transferred to the workplace.

Nevertheless, there are some limitations of this research. First, data for training transfer evaluation was collected using trainees' self-perception. Hence, future research should include other sources of training transfer evaluation, such as using 360 degree feedback to verify training transfer. Secondly, data was collected using quantitative research;

Appendix A

The 10 items questionnaire to determine training transfer for safety implementation using the Malaysian sample.

Number	Questions in English (Source from Zacharatos, 2001)	Translation into Malay language
1	I carry out my work in a safe manner.	<i>Saya menjalankan kerja saya dengan cara yang selamat.</i>
2	I use all necessary safety equipment to do my job.	<i>Saya menggunakan semua peralatan keselamatan yang diperlukan untuk melakukan kerja saya.</i>
3	I always report all safety-related incidents.	<i>Saya selalu melaporkan semua insiden keselamatan yang berkaitan.</i>
4	I work as safely as I possibly can.	<i>Saya bekerja secara selamat dengan sebaik yang mungkin.</i>
5	I am involved in improving safety policy and practices.	<i>Saya terlibat dalam meningkatkan polisi dan amalan keselamatan.</i>
6	If I think an action will make work safer, I initiate the action to improve work procedures.	<i>Jika saya rasa sesuatu tindakan akan membuat kerja lebih selamat, saya memulakan langkah tersebut untuk memperbaiki prosedur kerja.</i>
7	I voluntarily carry out tasks or activities that help to improve workplace safety.	<i>Saya secara sukarela menjalankan tugas-tugas atau aktiviti-aktiviti yang membantu untuk meningkatkan keselamatan di tempat kerja.</i>
8	I often make suggestions to improve how safety is handled around workplace.	<i>Saya sering membuat cadangan bagaimana untuk meningkatkan pengendalian keselamatan di sekitar tempat kerja.</i>
9	I often try to solve problems in ways that reduce safety risks.	<i>Saya sering mencuba untuk menyelesaikan masalah kerja dengan cara yang dapat mengurangkan risiko keselamatan.</i>
10	I keep abreast of changes to do with workplace safety.	<i>Saya mengikuti perkembangan perubahan yang perlu dilakukan untuk keselamatan tempat kerja.</i>

Appendix B. Supplementary material

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.ssci.2018.07.012>.

References

- Ajslev, J., Dastjerdi, E.L., Dyreborg, J., Kines, P., Jeschke, K.C., Sundstrup, E., Jakobsen, M.D., Fallentin, N., Andersen, L.L., 2017. Safety climate and accidents at work: Cross-sectional study among 15,000 workers of the general working population. *Saf. Sci.* 91, 320–325.
- Arthur Jr., W., Bennett Jr, W., Edens, P.S., Bell, S.T., 2003. Effectiveness of training in organizations: A meta-analysis of design and evaluation features. *J. Appl. Psychol.* 88 (2), 234–245.
- Ashrafi, S.H.R., Poursoltani, H., Ghareh, M.A., 2016. The relationship between some perceived aspects of information and communication technology with sport community training of Khuzestan province. *Int. J. Pharmaceut. Res. Allied Sci.* 5 (3), 108–112.
- Aziz, S.F.A., 2018. Keberkesanan latihan dan pembangunan sumber manusia. Penerbit UKM, Bangi, Selangor, Malaysia.
- Aziz, S.F.A., Ahmad, S., 2011. Stimulating training motivation using the right training characteristic. *Indus. Commer. Train.* 43 (1), 53–61.
- Aziz, S.F.A., Selamat, M.N., 2016. Stimulating workplace learning through training characteristics and motivation to learn. *Jurnal Pengurusan* 48, 173–185.
- Baldwin, T.T., Magjuka, R.J., Lohr, B., 1991. The perils of participation: Effects of the choice of training on trainee motivation and learning. *Pers. Psychol.* 44, 51–65.
- Chiaburu, D.S., Tekleab, A.G., 2005. Individual and contextual influences on multiple dimensions of training effectiveness. *J. Eur. Ind. Train.* 29 (8), 604–626.
- Christian, M.S., Bradley, J.C., Wallace, J.C., Burke, M.J., 2009. Workplace safety: A meta-analysis of the roles of person and situation factors. *J. Appl. Psychol.* 94 (5), 1103–1127.
- Curado, C., Henriques, P.L., Ribeiro, S., 2015. Voluntary or mandatory enrollment in training and the motivation to transfer training. *Int. J. Train. Develop.* 19 (2), 98–109.
- Giangreco, A., Carugati, A., Denmark, A., Sebastiano, A., 2010. Are we doing the right thing? Food for thought on training evaluation and its context. *Personnel Rev.* 39 (2), 162–177.
- Grau, R., Martínez, I.M., Agut, S., Salanova, M., 2002. Safety attitudes and their relationship to safety training and generalised self-efficacy. *Int. J. Occup. Saf. Ergonom.* 8 (1), 23–35.
- Hofmann, D.A., Burke, M.J., Zohar, D., 2017. 100 years of occupational safety research: From basic protections and work analysis to a multilevel view of workplace safety

- and risk. *J. Appl. Psychol.* 102 (3), 375–388.
- Holte, K.A., Kjestveit, K., 2012. Young workers in the construction industry and initial OSH-training when entering work life. *Work* 41 (Supplement 1), 4137–4141.
- Ilham, R., 2016. Maut cuci tangki gas. *Berita Harian*, 26 Oktober.
- Khanzode, V.V., Maiti, J., Ray, P.K., 2012. Occupational injury and accident research: a comprehensive review. *Saf. Sci.* 50 (5), 1355–1367.
- Kirkpatrick, D., 1959. Techniques for evaluating training programs. *J. Am. Soc. Train. Direct.* 13 (3), 21–26.
- Kirkpatrick, D., 1996. Great ideas revisited: revisiting Kirkpatrick's four-level model. *Train. Develop.* 50, 54–57.
- Kontoghiorghes, C., 2004. Reconceptualizing the learning transfer conceptual framework: empirical validation of a new systemic model. *Int. J. Train. Develop.* 8 (3), 210–221.
- Laberge, M., MacEachen, E., Calvet, B., 2014. Why are occupational health and safety training approaches not effective? Understanding young worker learning processes using an ergonomic lens. *Saf. Sci.* 68, 250–257.
- Lee, J., 2010. Design of blended training for transfer into the workplace. *Brit. J. Edu. Technol.* 41 (2), 181–198.
- López-Arquillos, A., Rubio-Romero, J.C., Martínez-Aires, M.D., 2015. Prevention through Design (PtD). The importance of the concept in Engineering and Architecture university courses. *Saf. Sci.* 73, 8–14.
- Mullen, J., Kelloway, E.K., Teed, M., 2017. Employer safety obligations, transformational leadership and their interactive effects on employee safety performance. *Saf. Sci.* 91, 405–412.
- Namian, M., Albert, A., Zuluaga, C.M., Jaselskis, E.J., 2016. Improving hazard-recognition performance and safety training outcomes: Integrating strategies for training transfer. *J. Constr. Eng. Manage.* 142 (10), 04016048.
- Ngah, N., Ngah, H., Adnan, A.S. 2016. 402 buruh maut di tapak binaan dalam tempoh 6 tahun, 10 November 2016 [cited 3 April 2017]. *Berita Harian Online*. Available from <http://www.bharian.com.my/node/211414>.
- Noe, R.A., 2017. Employee training and development, sixth ed. McGraw Hill, Boston.
- Occupational Safety and Health Act, 2006. Occupational Safety and Health Act (OSHA). (1994). Department of Occupational Safety and Health, Ministry of Human Resources Malaysia (2006). 2017. [cited 3 April 2017]. Available from <http://www.mglsd.gov.sg/laws/occupational%20saftey%20and%20Health%20Act%202006.pdf>.
- Ricci, F., Chiesi, A., Bisio, C., Panari, C., Pelosi, A., 2016. Effectiveness of occupational health and safety training: a systematic review with meta-analysis. *J. Workplace Learn.* 28 (6), 355–377.
- Schwarz, U.V.T., Hasson, H., Tafvelin, S., 2016. Leadership training as an occupational health intervention: improved safety and sustained productivity. *Saf.Sci.* 81, 35–45.
- Steenma, H., Groeneveld, K., 2010. Evaluating a training using the “four levels model”. *J. Workplace Learn.* 22 (5), 319–331.
- Tai, W.-T., 2006. Effects of training framing, general self-efficacy and training motivation on trainees' training effectiveness. *Personnel Rev.* 35 (1), 51–65.
- Tharenou, P., 2001. The relationship of training motivation to participation in training and development. *J. Occup. Organizational Psychol.* 74 (599–621).
- Towler, A., Watson, A., Surface, E.A., 2014. Signaling the importance of training. *J. Managerial Psychol.* 29 (7), 829–849.
- Tsai, W.-C., Tai, W.-T., 2003. Perceived importance as a mediator of the relationship between training assignment and training motivation. *Personnel Rev.* 32 (2), 151–163.
- Tziner, A., Fisher, M., Senior, T., Weisberg, J., 2007. Effects of trainee characteristics on training effectiveness. *Int. J. Sel. Assess.* 15 (2), 167–174.
- Zacharatos, A., 2001. An organization and employee level investigation of the relationship between high performance work systems and workplace safety. Doctoral dissertation. Queen's University, Canada (UMI No 305494700).
- Zumrah, A.R., 2015. Examining the relationship between perceived organizational support, transfer of training and service quality in the Malaysian public sector. *Eur. J. Train. Develop.* 39 (2), 143–160.