

Development and Evaluation of a Training Program on Occupational Health Research and Surveillance in Turkey

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Objectives: The aim of this study was to increase knowledge and skills regarding occupational health surveillance and research in professionals. **Methods:** Following the Analysis, Design, Development, Implementation, and Evaluation model, several training modules have been designed and implemented in the course of 2016. Evaluation forms were distributed to 42 participants before the start and after each training module to measure changes in knowledge, skills, and self-efficacy. **Results:** The majority of the participants were satisfied and found the training relevant and interesting for adult learners. The level of self-efficacy increased after the trainings. Females and occupational physicians displayed higher scores than men and other disciplines. After 1 year, the self-efficacy level decreased, but the level was still substantially higher than before the training. **Conclusions:** Feedback on the implemented training program was favorable. Participants were able to acquire and apply competencies in the subject matter at short and long term.

Keywords: ADDIE model, adult training, evaluation, occupational diseases

Occupational safety and health (OSH) is a global concern: based on data sources from the World Health Organisation (WHO) and the International Labour Organisation (ILO), the worldwide economic burden due to work-related accidents, diseases, deaths, and loss of productivity is estimated to result in the loss of 3.9% of global gross domestic product (GDP), at an annual cost of €2.680 billion.^{1–2} Provision and promotion of a safe and healthy work environment should be a priority and regulated preferably in a separate legislation. In Turkey, a new Act on Occupational Safety and Health (OSH Law No. 6331) was adopted in 2012 and raised challenges such as the need of employers and workers to receive assistance and expert support in their obligation to assess and improve their working conditions. A review article on evaluation studies on education in OSH showed that it is a great challenge to educate large numbers of workers, supervisors, and managers, as well as OSH and other professionals. The authors concluded that education in OSH itself is scarce and that the effectiveness can be improved. To increase coverage, quality, and efficiency, good studies have to be promoted and supported through international collaboration.³

The Public Health Institution of Turkey (PHIT) has been established as an affiliated body of the Ministry of Health to run primary health care services and to conduct research for protecting health, controlling, and preventing diseases. Notwithstanding, Turkey has a very poor record on the prevention of occupational diseases and awareness regarding work-related health complaints. The number of officially compensated occupational diseases has been unexpectedly low in Turkey. Based on the global rate of occupational diseases (4 to 12 per thousand workers), the expected number of occupational diseases in Turkey would be 50,000 to 140,000 annually. However, the annual number of occupational diseases reported is around several hundred cases only.⁴ As in many other countries, occupational diseases are underdiagnosed, the quality of notification is low and the reporting of all suspected cases needs improvement.^{5–6}

To strengthen the scientific capacity in the field of occupational health, the PHIT has partnered with TNO, Netherlands Organisation for Applied Scientific Research and the Amsterdam Free University Medical Centre both from the Netherlands and with Ghent University in Belgium. A 3-year project (acronym ESPrIT) was launched (January 1, 2016 to December 31, 2018) with the support of the European Union to improve notification and preventive policy of occupational diseases through trainings, mentoring, exchange visits, and networking opportunities.

To further qualify PHIT staff as professionals in scientific research and occupational health surveillance, a training program was generated, following the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) model of instructional design.⁷ Instructional design refers to the systematic process of translating principles of learning and instructions into plans for instructional materials and activities.^{8–9} This article describes the process that was used to develop the training, which, together with needs assessment and evaluation at several occasions, is crucial for successful training and long term sustainable improvements.

METHODS

Study Design and Population

A before and after study design without an external control group was used. A total of 42 staff members were eligible from PHIT in Ankara and connected Community Health Centres in various regions in Turkey. They are a mixed target group of OSH professionals such as occupational physicians, nurses, safety experts, or biologists.

The Training Program Based on the ADDIE Model

The partners from the Netherlands and Belgium led the program, using the five basic steps of the ADDIE model (Fig. 1) and taking into consideration key principles of adult learning.¹⁰ The best learning environments for adults are the ones that are collaborative and utilize a problem-based approach. In this way, participants obtain and apply knowledge and skills custom made for their work environment and that will help them to improve their situation.¹¹

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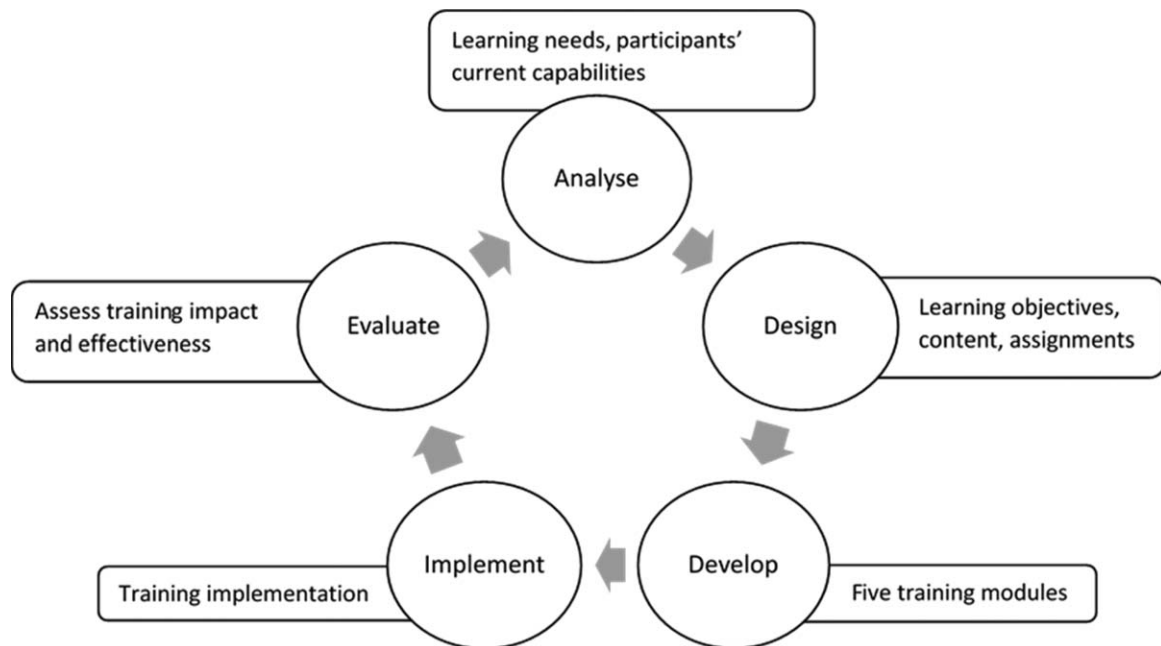


FIGURE 1. Developmental process, based on the ADDIE model for the training program in the ESPrIT project.

First step: In the analysis phase, the learning environment and participants' existing knowledge and skills were identified through a survey and project meetings. To collect additional data on trainees' characteristics, an intake form was used. An inventory of knowledge gaps among PHIT staff in the field of OSH and of the different needs for additional learning materials helped us to identify the instructional problems and objectives.

Second step: Tasks in the design phase evolved around learning objectives, content, exercises, assignment of activities in the field, and assessment instruments. The program aims to introduce and familiarize the participants with the subjects of occupational health surveillance, epidemiology, and scientific research methods. After they have acquired basic knowledge and skills and depending on specific needs and preferences, staff members will be further trained in specialized subgroups. In addition, half of the participants will be trained to educate and support qualified professionals in the field such as in the Community Health Centres.

Third step: In the development phase, the trainers created new materials and used, adapted, and translated existing learning materials courses with permission of the authors, for example, the student manual and slide series, developed for the "Master of Science in International Occupational Safety and Health" course for Latin America (www.osh-munich.de), served as basis for our modules.¹² In addition, time schedules, deadlines, scheduling of participants, booking of venue, and accommodations were arranged. All the learning material is free and available at the project website in English and in Turkish under Creative Common licenses (<http://www.esprit-ohs.eu/en/>).

Fourth step: Program implementation was performed from September to December 2016.

Fifth step: Different approaches were used to have the program evaluated by the participants at several moments in time. First, a questionnaire was administered anonymously to all participants immediately after each training using a Likert scale ranging from fully disagree (1) to fully agree (5) to assess the opinion on several statements regarding the content, duration, and organization of the training. Examples are as follows: "This training will help me to better perform my job tasks" and "The trainers stimulate active

participation." Second, participants rated their level of satisfaction on a scale from 0 (low) to 10 (high) regarding all parts of the trainings they participated in. Next, participants were asked to freely react and provide us with recommendations to improve the training. Third, to evaluate achievements and changes in participants' beliefs about their capabilities to produce designated levels of performance, we asked them to fill in a self-efficacy test.¹³ This questionnaire was administered online before the trainings (T1), after the basic training (T2), and after the whole training (T3, 3 months later). They were asked to indicate on a scale from 0 to 100, the degree of certainty that they have knowledge/mastery of the subject matters. In total, 20 questions were posed each time: 10 items for investigating knowledge and skills in Occupational Health Surveillance, for example, "To explain to a colleague the importance of registration of occupational diseases" and 10 items for scientific research, for example, "To select the best study design to conduct research on a specific occupational health issue." After 1 year (T4), participants were requested to complete a similar questionnaire consisting of the self-efficacy items and additional questions on their involvement in occupational health research and training in the past 12 months.

Statistical Analyses

Statistical analyses were carried out by using IBM SPSS Statistics 23.0 for Windows. To determine demographic characteristics, frequencies (*N*) and percentages (%) were calculated.

A paired *t* test and ANOVA were performed to compare the scores between the different time measurements and groups. Cronbach α was calculated to check the reliability of the self-efficacy scale: all alphas (before the training, after the basic session, after the whole training, and after 1 year) were higher than 0.91, indicating that the internal consistency was very good.

Statistical significance was defined as $P < 0.05$.

RESULTS

Study Participants

Descriptive characteristics of the participants who enrolled in all the trainings ($n = 42$: 21 men and 21 women) are presented in

TABLE 1. Characteristics and Scores of the Participants ($n = 42$)

Variable	N	%	Mean	SD	Median
Age, yrs			42.2	6.9	
Sex					
Men	21	50.0			
Women	21	50.0			
Occupation					
Occupational physician	12	28.5			
Safety expert	16	38.0			
Other, for example, nurse, biologist	12	28.5			
missing	2	5.0			
Self-efficacy score (on 100)					
T1 before the training	42		62.7	23.4	64.5
T2 after basic training	42		78.1	14.5	79.6
T3 at the end of the training	37		84.3	13.0	88.5
T4 after 1 yr	34		76.6	15.6	78.3

Table 1. The mean age is 42.2 (± 6.9) and more (para)medical professionals are included than nonmedical professionals. After 1 year, 34 participants responded to the follow-up questionnaire. Some staff members dropped out from the project, but these persons did not differ from the responders regarding sex, age, and discipline.

Content and Structure of the Training Program

The final program consisted of five different training sessions. The overview of these five training sessions was as follows:

1. Basic training occupational health and scientific research
2. Training scientific research skills and methodologies
3. Training diagnosis and surveillance of occupational diseases
4. Workshop on surveillance and research
5. Train the trainer

Figure 2 shows the structure of the program and the distribution of the participants over the various training sessions. First, all participants were trained along a basic program on occupational health and scientific research to lay a solid ground for common understanding and knowledge on occupational health and diseases. This training took place in two parallel groups for 5 working days and 2 homework days. Subsequently, the total group was divided in two subgroups of 21 persons each. Based on the preferences of the participants and the participants' performance evaluated by the trainers, staff members specialized either in a subgroup on scientific research skills and methodologies (group A) or in a subgroup on diagnosis and surveillance of occupational diseases (group B). Each subgroup was qualified for another 5 training days and 3 homework days. As the main learning outcome, participants in group A developed, in six small working groups, a scientific study protocol based on a self-determined topic in the area of occupational diseases. In group B, participants in six small working groups designed a protocol for a new health surveillance system tailor made for a specified group of risk factors and occupational diseases. After these advanced trainings, two parallel workshops of 2 days each were organized to exchange and share experiences. Each workshop group of 21 participants consisted of a mix of group A and B. Finally, a selection was made based on the preferences of the participants and the advice of the international trainers of 10 persons from group A and 10 from group B to form group C that followed a train-the-trainer program of 5 days.

Evaluation of the Training Program

Scores for the evaluation of the training modules were high. Scores below 4.0 (on a Likert scale ranging from 1 = fully disagree to 5 = fully agree) were found for only 3 out of 16 statements. The

duration of the training A scored 3.8 in contrast with the duration of training B that scored 4.4. The quality of the training venue scored between 2.8 and 3.5 in various groups and the teaching materials of training B were scored as less sufficient due to problems with translation (score 3.8). Participants were satisfied with all parts of the program because the assessments were in the range from 8.3 to 9.5 on a total out of 10.

Table 1 shows that the total mean and median self-efficacy scores (maximum score is 100) increased significantly after the basic training to 78.1 and 79.6, respectively, compared with 62.7 and 64.5 before the basic training. Self-efficacy continued to rise after the advanced training to a mean of 84.3. After 1 year, the self-efficacy scores dropped a bit to 76.6 (mean) and 78.3 (median) which is still substantially higher than the values before the training program.

Figure 3 illustrates that women had a higher mean total self-efficacy score than men but this was not statistically significant ($P > 0.05$), whereas significant differences were found between disciplines: occupational physicians displayed significantly better results in comparison with all other professions ($P = 0.003$). No relation was observed between age and self-efficacy beliefs.

During the last 12 months, the majority of the participants were actively involved in research (Table 2) and/or health surveillance projects and 15 staff members provided trainings to colleagues. Several study protocols that were developed and initiated during the trainings A and B were further elaborated, implemented, and monitored.

DISCUSSION

The aim of this joint international project is to strengthen the scientific standing of the Public Health Institute in Turkey in the field of occupational health, with a particular focus on occupational diseases. An important cornerstone in achieving the desired results is a high-quality training program. To address this challenge, we used the ADDIE instructional design method as a framework in designing and developing an adult education program. This model was chosen because previous research found it particularly effective in providing developers with a generic, systematic framework that is easy to use and applicable to a variety of settings.⁸

In the start, the most challenging step was tailoring the program to the target group and looking for examples and authentic cases from Turkey. As English vocabulary knowledge and proficiency were not at the same level for all participants, a lot of time and effort was put beforehand into the translation of the learning materials into Turkish. The onsite trainings were held in a cordial and productive atmosphere, but were also very labor intensive for

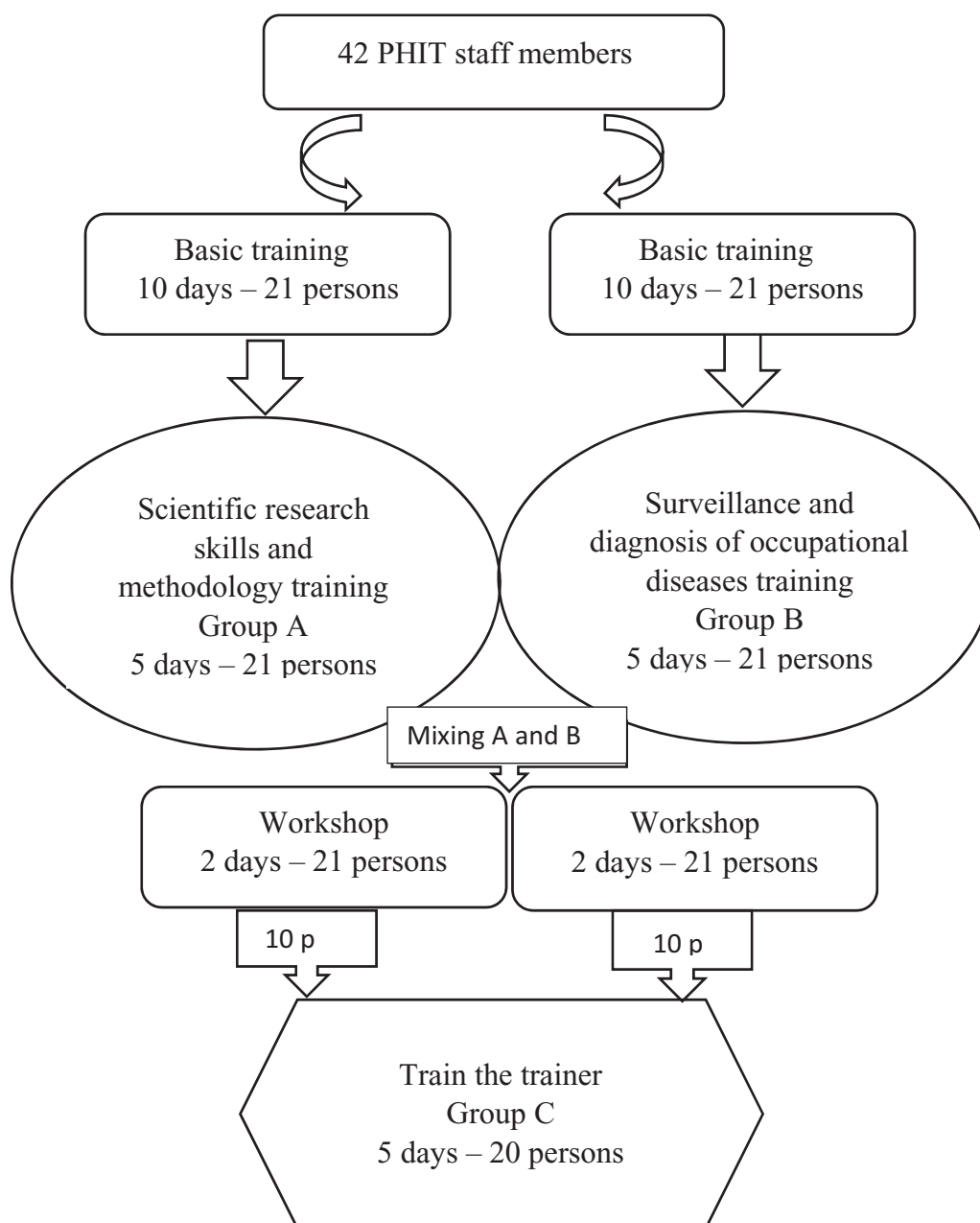


FIGURE 2. Scheme of the training program for staff members of the Public Health Institution of Turkey (PHIT).

teachers and participants dealing with simultaneous translation and adapting to cultural differences.

When evaluating the training, we found that it was interesting, useful, and acceptable by the majority of the participants. Most PHIT staff members were satisfied and learned about, from, and with each other. Such occasions when students from two or more professions in health and social care learn together during all or part of their professional training are referred to as “interprofessional education.” Bringing together participants from different professional and regional backgrounds enables effective collaboration in the future and improved health outcomes.^{14,15}

One of the items that scored less was the duration of advanced scientific training (group A). One week was regarded too short to be able to process all the new knowledge and skills and to develop a

scientific study protocol that is complete and well designed. Other negative statements concerned the training environment. Due to the large group of participants, teachers, and interpreters, trainings were organized in seminar rooms of hotels that were not well equipped as training accommodation. The results indicate that participants’ self-efficacy beliefs with regard to research and health surveillance largely improved after the training program. As could be expected, the scores dropped 1 year after the training, but were still substantially higher than at baseline. This is in line with other studies.^{16–19} Research suggests that ongoing support could overcome decreases in self-efficacy.^{16–18}

No correlations were observed between age and total self-efficacy scores. In our participants, the age range varied between 29 and 56 years, with a mean of 42 years (SD 6.9), indicating a limited

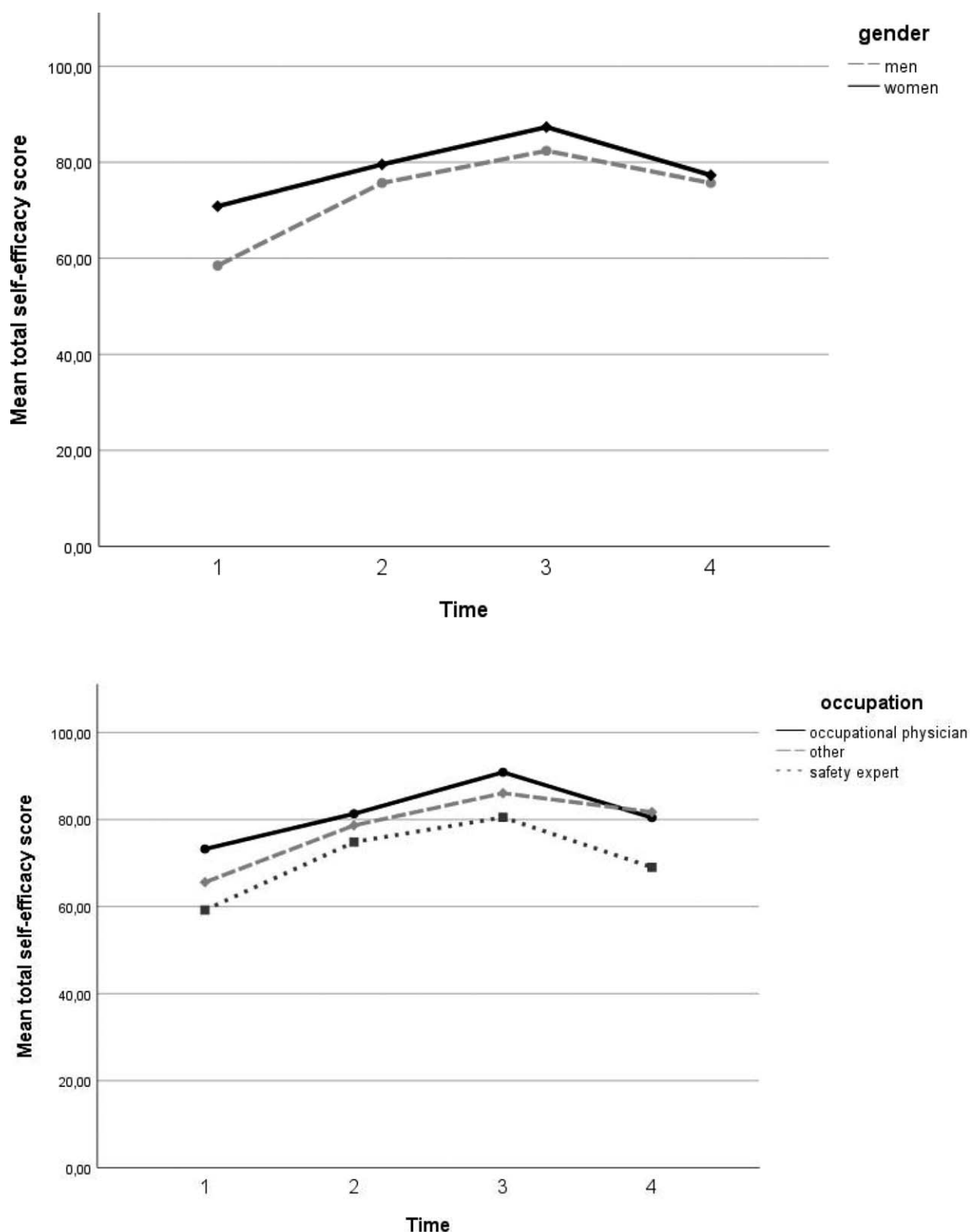


FIGURE 3. Mean total self-efficacy score in performing occupational health surveillance and related scientific studies, over time by gender and occupation (T1 before training, T2 after basic training, T3 at the end of the training, T4 after 1 year).

spread that might explain the lack of correlation found. The trainings have been implemented in a period of 3 months; therefore, age did not change for the majority of the participants during the training

but their self-efficacy scores did. Moreover, the participants had all professional experience in occupational health and safety. Overall, women displayed higher scores in comparison with men, although

TABLE 2. Involvement in Scientific Research and Occupational Health Surveillance 1 year After the Training Program ($n = 34$)

	Yes n (%)
Were you involved in scientific research last year?	
Study design	28 (82.4)
Data collection	23 (67.6)
Data analysis	18 (52.9)
Reporting	11 (32.4)
Implementing study results into policy or practice	8 (23.5)
Were you involved in surveillance systems for occupational diseases last year?	
Study design	18 (52.9)
Data collection	15 (44.1)
Data analysis	11 (32.4)
Reporting	10 (29.4)
Implementing study results into policy or advice	20 (58.8)
Did you train colleagues in scientific research?	14 (41.2)
Did you train colleagues in surveillance systems?	9 (26.5)

the final differences were small and not statistically significant. In addition, the standard deviation is large, indicating large differences between the individuals in both sex groups, especially before the training. Occupation had also an impact on self-efficacy scores: occupational physicians had a statistically significant higher score than other professions (eg, nurses, biologists) who had, in turn, significantly higher scores than safety experts. A possible explanation may be found in the trainings focusing on epidemiology, diagnosis, and surveillance of occupational diseases; in these issues, occupational physicians have more experience a priori than the other disciplines.

In terms of impact in the long term, the future looks good. The participants were able to apply their new competencies into practice by conducting scientific projects and training colleagues. During the last year, 6 research and surveillance protocols out of the 12, prepared during the trainings, have been carried out. Cross-sectional data collection and analysis on different occupational issues (eg, musculoskeletal disorders in construction workers, burn-out in bank employees, etc.) took place in several provinces and cities. In addition, three research projects were selected for further elaboration with the international partners through exchange visits, mentoring, and coauthoring. Four exchange participants have paid extra visits to Belgium and the Netherlands improving their knowledge and competencies. At present, several posters were presented and oral contributions were held at (inter)national conferences. Drafts of both Turkish and English articles are in progress and will be submitted within a short period to peer-reviewed journals.

As a direct result of the evaluations and the feedback on several other occasions, some changes have been made in the training program, for example, the addition of a module on presentation skills to the basic training. Ultimately, the project will generate a training program that has set a quality reference point and a benchmark for strengthening the occupational health expertise and scientific capacity of PHIT. The generation of evidence on workers' health will be translated into preventive policy and actions in the coming years. Setting definite endpoints would contribute to the sustainability and impact of the project. However, such outcomes were not formulated because our aim was scientific capacity building. Future projects will elaborate on our findings by including goals such as increasing the use of protective equipment, lowering exposure to dangerous substances, and so on.

Despite the positive results and strengths mentioned above, our study has a number of limitations. The use of questionnaires with a Likert style response set, although common and widely accepted, and the participants' self-rating of self-efficacy can be considered as methodological weaknesses because of the risk of response bias. Several types exist, for example, respondents have a tendency to agree with statements as presented (acquiescence bias) and to answer questions in a manner that will be viewed favorably by others (social desirability bias). In our study, the very high scores on the evaluations may raise the question of social desirable answers. The increase in self-efficacy scores may reflect a true change, but as the study had a before and after design without a control group, secular trends and a regression to the mean may have influenced the accuracy of these assessments. With regard to the opinion and satisfaction part of the study, efforts were undertaken to limit the effects of response bias (eg, questions were anonymous) and to obtain additional feedback through group discussions. The group discussions, however, confirmed the positive results of the questionnaires. Nevertheless, the discussions were only short. It is possible that a longer group discussion or the use of other questions would have yielded more critical answers useful to improve the course. This study was performed within 42 staff members from the PHIT in Ankara and Community Health Centres in various regions of Turkey. At 1-year follow-up, some participants dropped from the project because they left the Institute or did not complete the questionnaire. Therefore, the group of trained OHS professionals is not large, but these experts may act as multipliers and as regional leaders for research and OHS training in Turkey. Future studies are needed to establish whether the present results can be generalized to other institutes and countries.

CONCLUSION

A systematic design plan (ADDIE) resulted in a successful delivery of a training that responded to a perceived need to improve research in occupational health and systematic health surveillance in Turkey to prevent occupational diseases. Participants evaluated the program as interesting and applicable for adult learners. Knowledge and skills gains were achieved as self-efficacy increased. In the year after the training, many participants were able to apply—with support—the new acquainted competencies into practice.

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