

## Respiratory School (Smoke and COPD)

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### Abstract

#### Objective

Within the scope of TUBITAK Nature and Science Schools Projects, it aimed to provide training for teachers working in schools connected to National Education in Isparta Province to raise awareness about smoking and harms.

#### Material and Method

Two hundred and thirty-one teachers (112 (48.48%) men and 119 (51.52%) women) participated in the training. A pre-test and post-test control group-free experimental study design was applied to measure

training effectiveness during the Respiratory School project. At the end of the training, participants were asked to write their positive and negative feedback about the project using the so-called critical events technique. The questionnaire included information on satisfaction with education and trainers, demographic characteristics and thoughts about smoking, and the effect of education. A total of 196 participants completed the questionnaire.

#### Results

Most participants were women (52.9%) aged 36 to 45 (46.2%). Most of the participants had teaching experience between 16 and 25 years. There was a

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significant improvement in correct answers between the pre-test and the post-test on all training days ( $p < 0.001$ ). The Cronbach's alpha was 0.904, and the average response to training questions was 4.68. The reliability of our findings is underscored by a Cronbach alpha value of 0.969, with a mean expression score of 4.77, highlighting the reliability of the participants' responses. Approximately 26% of the participants ( $n=44$ ) reported smoking. However, the incidence of smoking among family members of the participants was markedly higher, 47.9% ( $n=79$ ). Similarly, the proportion of participants who had a spouse smoking

was noteworthy (31.4%;  $n=48$ ). had attempted to quit smoking at some point, but only three participants (5.8%) sought help in their quitting efforts. Of the participants, 75% ( $n=33$ ) acknowledged that they had quit smoking but later resumed.

### Conclusion

The teachers who participated in the training found it helpful and increased targeted awareness.

**Keywords:** Respiratory school, Smoke, COPD, CET

## Introduction

The main task of the respiratory system is to provide the oxygen needed by the organism from the atmosphere and remove the released carbon dioxide from the organism. The respiratory system comprises the respiratory organ (lungs) and the respiratory tract (1).

All tobacco products, especially cigarettes, such as cigars, pipes, cigarettes, and hookahs for tobacco use, show similar effects and damages. New products thought to be less harmful or harmless than tobacco in the mid-20th century have been developed. These include cigarette types (light, mild, ultralight, etc.), smoke-like products that produce smoke, and smokeless tobacco products. However, they have been shown to have similar effects and harms (2-5). Cigarettes include tobacco, paper, filter parts, additives, pesticides, fertilizers, fumigants, and processing agents used during fabrication. As a result, more than 4000 harmful substances are found in cigarette smoke. In 1985, the International Agency for Research on Cancer adopted cigarette smoke as the first group of carcinogens for human beings. It is crucial to understand that the substances in the smoke are not just harmful, but are pharmacologically active, mutagenic, or toxic (6, 7).

Maraş grass indisputably increases the risk of oral and pharyngeal cancers, just like other smokeless tobacco products. Numerous studies confirm the link between smokeless tobacco use and cancer. According to a study published in 2008, the risk of oral, pharyngeal, pancreatic, esophagus, and lung cancer increases (8-10).

The most significant harm caused by smoking to human health is to the lungs, and is often a cause of

chronic obstructive lung disease. Chronic Obstructive Pulmonary Disease (COPD), according to the Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease 2025 report, is a heterogeneous lung condition characterized by chronic respiratory systems (dyspnea, cough, sputum production and/or exacerbations) due to abnormalities of the airways (bronchitis, bronchiolitis) and/or alveoli (emphysema) that cause persistent, often progressive, airflow obstruction (11). COPD is one of the leading causes of death in most countries. For example, it was the third leading cause of death in the United States. It is estimated that around three million deaths annually due to COPD worldwide, and the increased prevalence of smoking in low- and middle-income countries (LMIC), combined with aging populations in high-income countries, will lead to more than 5.4 million annual deaths from COPD and related conditions by 2060 (12). In a study investigating mortality from COPD in our country, the mortality rate in 427 COPD patients followed for four years was 17.3% (13). As a result, COPD is a public health problem that has a high mortality, morbidity, and economic burden for our country and all over the world.

A large volume of data has been accumulated on tobacco and health issues around the world. Numerous studies have been published that support the strong association of tobacco use with various adverse human health effects, most prominently with cancer, cardiovascular disease, and COPD. Although susceptibility to smoking-related flow restriction is rather individual due to the interaction between environmental factors and the host in patients with COPD, cessation of smoking is the primary treatment to prevent the development and progression of COPD (14). Therefore, smokers should be encouraged to quit. We believe that informing our teachers, who are important role models in society regarding smoking

and COPD, will contribute to the students. As the most critical risk factor in the development of COPD in the respiratory school project, the results of smoking were reported with theoretical and practical applications.

## Material And Method

The project is not only the transfer of knowledge and skills, but also social sensitivity, health, quality of life, and role models. The project involves transferring knowledge, skills, and social sensitivity to improve health, and quality of life, and provide role models.

There is an agreement outlining a project involving 250 teachers, which includes both smoking and non-smoking educators. The target audience will be selected by the Research and Development Unit of the Isparta National Education Directorate, a partner institution with the state secondary schools in the region. The Research and Development Unit has determined half of the teachers will participate in the training. The Research and Development Unit hung the project poster in a visible place in the Directorate of National Education and Schools, and it turned the poster until the end of the project. The selected target groups for this initiative are secondary and high school teachers. The project aims to empower teachers to become role models in society by increasing their awareness of smoking and related diseases. It seeks to ground this awareness in scientific knowledge, thereby enhancing the project's impact and effectiveness. After the project, it is expected that teachers, who are the target audience, will have a positive change in their perspective on smoking, gain empathic thinking skills, and increase their knowledge and understanding of the long-term effects of smoking. This change aims to measure and evaluate how the gains and expectations will be realized;

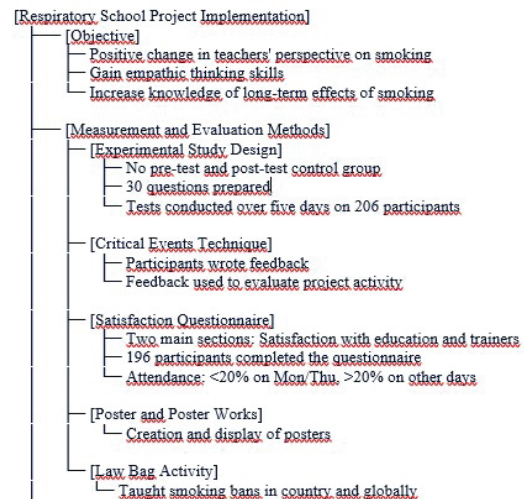
1. To measure the effectiveness of training given during the 'Respiratory School' project process, an experimental study design without a pre-test and a post-test control group was applied. A total of 30 questions were prepared during the day. The pretest-posttest questions were formed from a total of 8 different training contents. Participants were asked questions before and after the start of the training. For five days, tests were performed on 206 participants.

2. At the end of the training, the participants of the Respiratory School project were asked to write their positive and negative feedback about the project using a method called the critical incidents technique. The project activity was evaluated with this form.

3. A questionnaire was applied to the participants to test the satisfaction of the training and effectiveness of the training during the 3rd Respiratory School project. The questionnaire consisted of two main sections. The first part consisted of expressions of satisfaction about education and trainers. After the completion of the training programs, a survey was conducted at the end of the day. A total of 196 participants completed the questionnaire. Less than 20% of participants were present in the sessions held on Monday and Thursday, and more than 20% on other days.

4. Poster and poster works were made.

5. In addition, the bag activity law and the smoking bans applied in our country and the world were taught.



**Figure 1**  
Method as a flow chart

As a result, practical and theoretical information about smoking and chronic diseases was conveyed to teachers within the scope of the project. Therefore, changes and gains in teachers' sensitivity and awareness, empathic thinking, social skills, and characteristics of entrepreneurship were measured and evaluated with the methods mentioned above.

At the end of the project, the training materials were shared in printed and digital media for the teachers who participated in the project to make the gains permanent for the participants and develop. Materials to be provided in relation to the project: general information, case studies, articles, events, videos, etc. The topics will be shared, and brochures, books, and training material will also be provided.

Statistical analysis of the study was performed with the SPSS 20.0 program. Descriptive measures were presented as frequency (percentage) for categorical and mean $\pm$ SD (median, min-max) for numerical variables. The normality assumption was checked by Kolmogorov-Smirnov test, and the scores were distributed normally. Paired sample Student t-test was used for comparison of two dependent groups for pre and post-test scores, and one-way analysis of variance (ANOVA) was used for comparison of multiple groups. Pairwise comparisons of significant results were performed using the Tukey HSD post-hoc test. In all analyses,  $p < 0.05$  was considered statistically significant result.

## Results

Most of the participants were women (52.9%) aged 36 to 45 (46.2%). The study found that 16.4% of participants were between 25 and 35 years old, whereas 37.4% were between 46 and 65. The teaching experience differed between 11-25 years, where 68.2% had 16-25 years, and 14.7% had 11-15 years of experience. Most participants (94.7%) were married. Approximately one-quarter of the participants (26%) reported being smokers; however, the rate of smoking within their families was higher at 47.9%. Additionally, 31.4% had a spouse. Among those who had used or were currently using cigarettes, more than half (57.4%) expressed a desire to quit smoking. However, only 3 participants (5.8%) sought help to quit. Among the participants who had previously stopped smoking, 75% indicated that they had resumed smoking. The reasons for restarting smoking included psychological factors (45.5%), environmental influences (33.3%), and physical factors (21.2%).

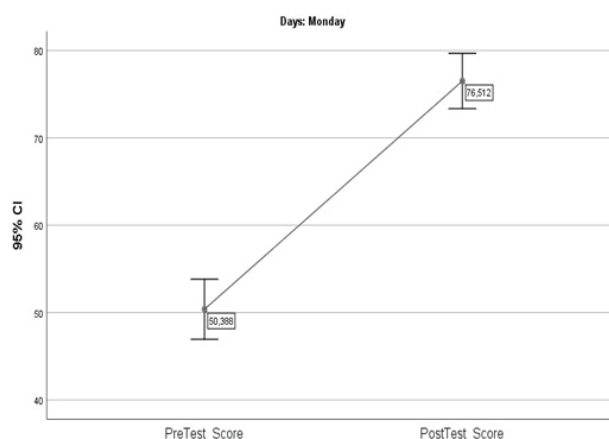
A questionnaire was applied to the participants to test their satisfaction with the training and effectiveness of the training during the "Respiratory School" project. A total of 196 participants completed the questionnaire. Less than 20% of the participants were present at the sessions held on Monday and Thursday, and more than 20% on other days.

Questions were asked about their status of smoking. A total of 40 participants answered these questions. The items 'I don't intend to quit in the next 6 months' and 'I intend to smoke in the future, but I intend to reduce it' had equal (27.5%) ratios. The item 'I am planning to quit within 30 days' was selected by 10 participants (25%). The item 'I can stop in 6 months, but not in 1 month' was selected by 6 participants (15%), while only 2 participants (5%) preferred 'I have no intention to reduce.' For the items on the effectiveness of the

training in the project, 86.8% of the participants chose 'I increased my level of knowledge,' 82.3% chose 'I think I should keep my students away from smoking as much as possible,' 15.8% of the implied 'I started to give up smoking.' One participant answered, 'I have no expectations.' 9.2% of all participants had alcohol use, and only one participant stopped using it.

The mean and median smoking age was  $20.44 \pm 3.98$  (20) years. The monthly expenditure on cigarette consumption was  $241,27 \pm 186,88$  (200) TRY. On the other hand, the answer was  $2.5 \pm 1.38$  times for the question of how many times smoking was stopped before.

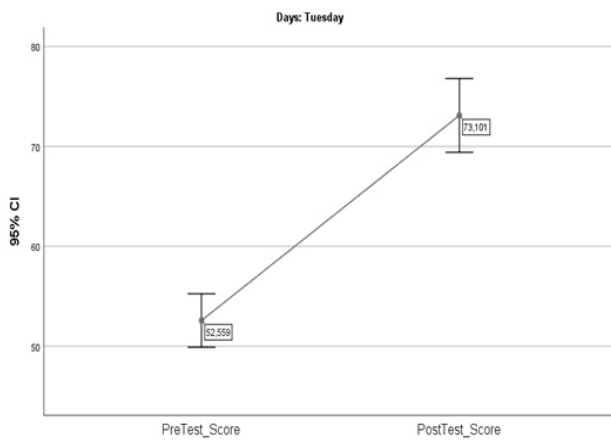
The average values of the correct pretest and posttest answers were 14.61 and 22.78, respectively. The difference between the correct pretest and posttest answers was significant on all training days ( $p < 0.001$ ). Similarly, the difference between the pretest and posttest scores was significant. The final test scores were higher. The mean score of the final test was 75.95, and the mean of the pretest was 48.72. The difference between the pretest scores on Tuesday and Thursday was significant ( $p = 0.020$ ). However, Wednesday and Friday were the days when the difference between the final test scores was significant ( $p < 0.001$ ). Information showing the descriptive measures of the correct answers and scores from the pretest and after the test according to the training days is presented in Tables 1 and 2. The pretest and posttest scores according to days are presented in Figure 2 and Figure 9.



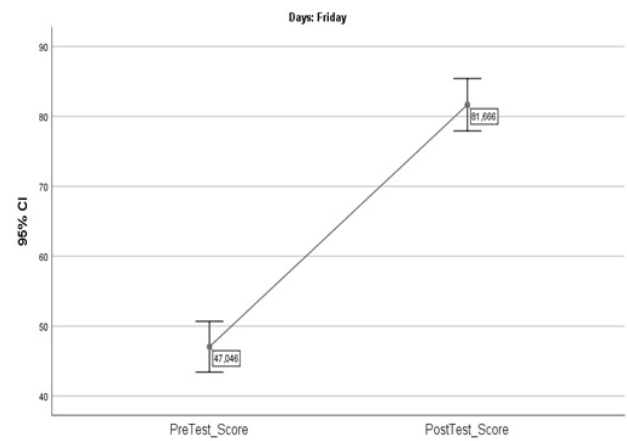
**Figure 2**

Pre- and post-test scores of Monday training

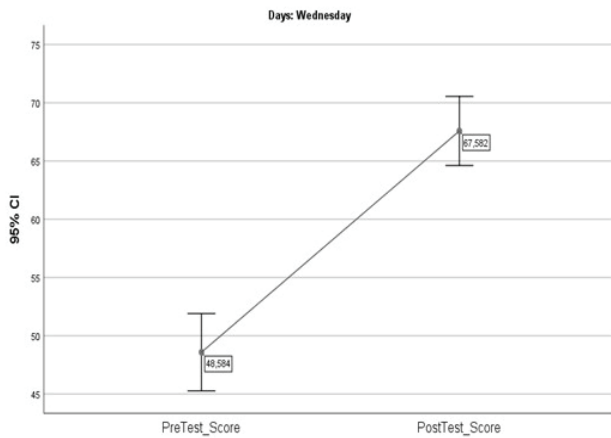
The training satisfaction section included 10 items. Participants reported an average satisfaction score of 4.68. The reliability of these items was high, with a Cronbach's alpha of 0.904. In addition, there were



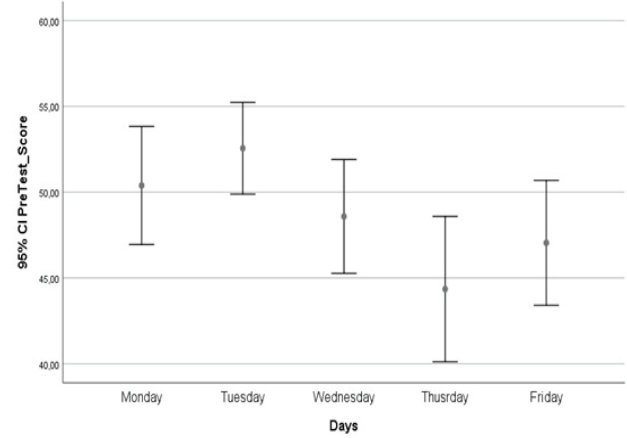
**Figure 3**  
Pre- and post-test scores of Tuesday training



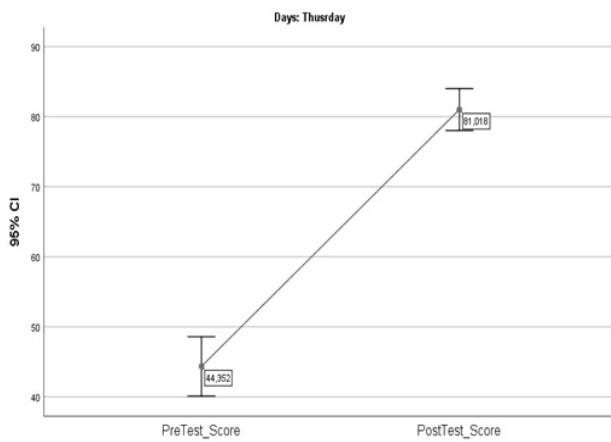
**Figure 6**  
Pre- and post-test scores of Friday training



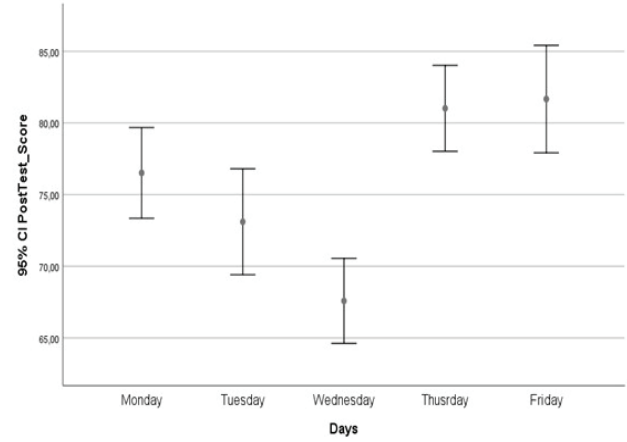
**Figure 4**  
Pre- and post-test scores of Wednesday training



**Figure 7**  
Pre-test scores according to days

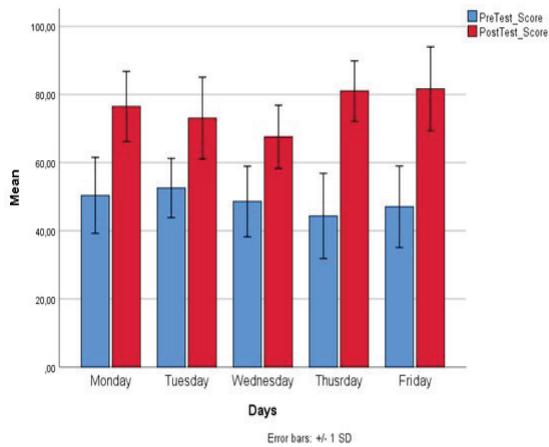


**Figure 5**  
Pre- and post-test scores of Thursday training

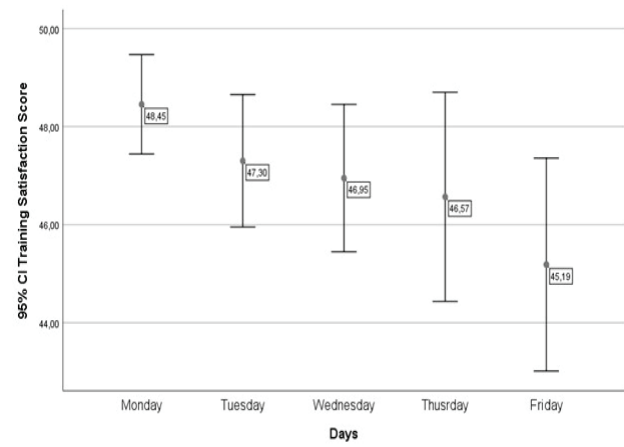


**Figure 8**  
Post-test scores according to days





**Figure 9**  
Pre- and post-test scores according to days



**Figure 10**  
Training satisfaction scores according to days

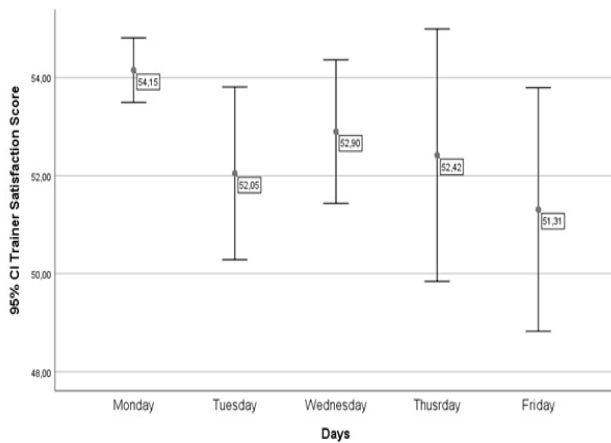
**Table 1** Pre- and Post-test correct answers according to training days

| Training day      |                    | Pre-test correct answers | Post-test correct answers | P <sub>re-post-test</sub> |
|-------------------|--------------------|--------------------------|---------------------------|---------------------------|
| Monday            | Participant number | 43                       | 43                        | <0.001                    |
|                   | Mean±SD            | 15.11±3.35               | 22.95±3.08                |                           |
|                   | Median, min, max   | 16. 8. 21                | 23. 15. 28                |                           |
| Tuesday           | Participant number | 43*                      | 43                        | <0.001                    |
|                   | Mean±SD            | 15.76±2.60               | 21.93±3.60                |                           |
|                   | Median, min, max   | 16. 10. 21               | 22. 6. 27                 |                           |
| Wednesday         | Participant number | 40                       | 40**                      | <0.001                    |
|                   | Mean±SD            | 14.57±3.11               | 20.27±2.78                |                           |
|                   | Median, min, max   | 15. 8. 20                | 21. 10. 25                |                           |
| Thursday          | Participant number | 36*                      | 36                        | <0.001                    |
|                   | Mean±SD            | 13.30±3.75               | 24.30±2.65                |                           |
|                   | Median, min, max   | 13. 7. 20                | 25. 17. 28                |                           |
| Friday            | Participant number | 44                       | 44**                      | <0.001                    |
|                   | Mean±SD            | 14.11±3.59               | 24.50±3.70                |                           |
|                   | Median, min, max   | 14. 5. 21                | 25. 11. 29                |                           |
| Total             | Participant number | 206                      | 206                       |                           |
|                   | Mean±SD            | 14.61±3.36               | 22.78±3.54                |                           |
|                   | Median, min, max   | 15. 5. 21                | 23. 6. 29                 |                           |
| P <sub>days</sub> |                    | 0.020                    | <0.001                    |                           |

SD: Standard deviation,

\*: the significance of Pre-test correct answers between days

\*\*: the significance of Post-test correct answers between days



**Figure 11**  
Trainer satisfaction scores according to days

11 items related to the trainers, which also received a relatively high average satisfaction score of 4.77, with Cronbach's alpha of 0.969. No significant differences were observed in satisfaction scores between different groups on various days. Generally, the average scores were quite similar. On the first day of the week, the educational satisfaction score was the highest, but it tended to decline as the week progressed. The trend for the trainers' satisfaction was similar, although participants reported higher satisfaction on Wednesday compared to Tuesday. Table 3 presents the satisfaction scores, and smoking characteristics based on the training days. Figures 10 and 11 illustrate these trends more clearly. The participants expressed positive opinions 92% about the project. These are:

**Table 2** Pre- and Post-test scores according to training days

| Training day |                    | Pre-test scores | Post-test scores | P <sub>re-post-test</sub> |
|--------------|--------------------|-----------------|------------------|---------------------------|
|              |                    |                 |                  |                           |
| Monday       | Participant number | 43              | 43               | <0.001                    |
|              | Mean±SD            | 50.38±11.17     | 76.51±10.28      |                           |
|              | Median, min, max   | 16. 8. 21       | 23. 15. 28       |                           |
| Tuesday      | Participant number | 43*             | 43               | <0.001                    |
|              | Mean±SD            | 52.55±8.69      | 73.10±12.00      |                           |
|              | Median, min, max   | 16. 10. 21      | 22. 6. 27        |                           |
| Wednesday    | Participant number | 40              | 40**             | <0.001                    |
|              | Mean±SD            | 48.58±10.37     | 67.58±9.27       |                           |
|              | Median, min, max   | 15. 8. 20       | 21. 10. 25       |                           |
| Thursday     | Participant number | 36*             | 36               | <0.001                    |
|              | Mean±SD            | 44.35±12.51     | 81.01±8.86       |                           |
|              | Median, min, max   | 13. 7. 20       | 25. 17. 28       |                           |
| Friday       | Participant number | 44              | 44**             | <0.001                    |
|              | Mean±SD            | 47.04±11.96     | 81.66±12.33      |                           |
|              | Median, min, max   | 14. 5. 21       | 25. 11. 29       |                           |
| Total        | Participant number | 206             | 206              |                           |
|              | Mean±SD            | 48.72±11.22     | 75.95±11.82      |                           |
|              | Median, min, max   | 15. 5. 21       | 23. 6. 29        |                           |
|              | P <sub>days</sub>  | 0.020           | <0.001           |                           |

SD: Standard deviation,

\*: the significance of Pre-test correct answers between days

\*\*:: the significance of Post-test correct answers between days

**Table 3** Training satisfaction scores according to the days

|                    |          | Training satisfaction scores | Trainers satisfaction scores | Smoking beginning age (year) | Monthly expenditure (TRY) | Smoking gives up trials (times) |
|--------------------|----------|------------------------------|------------------------------|------------------------------|---------------------------|---------------------------------|
| Days               |          | Mean±SD                      |                              |                              |                           |                                 |
| Monday sessions    |          | 48,45±2,86                   | 54,15±1,85                   | 18,66±4,27                   | 307,14±142,67             | 2,28±1,38                       |
| Tuesday sessions   |          | 47,30±4,38                   | 52,04±5,72                   | 20,75±2060                   | 228,57±191,17             | 2,33±1,15                       |
| Wednesday sessions |          | 46,95±4,70                   | 52,89±4,51                   | 21,00±3,53                   | 154,28±115,20             | 3,30±1,15                       |
| Thursday sessions  |          | 45,56±6,39                   | 52,41±7,60                   | 18,54±3,04                   | 222,0±147,72              | 1,66±1,21                       |
| Friday sessions    |          | 45,19±7,05                   | 51,30±7,96                   | 22,36±5,27                   | 335,83±275,76             | 2,25±1,89                       |
| <b>Total</b>       |          | 46,82±5,41                   | 52,48±6,06                   | 20,44±3,98                   | 241,27±186,88             | 2,50±1,38                       |
|                    | <b>p</b> | 0,255                        | 0,206                        |                              |                           |                                 |

- has increased awareness of cigarette and addiction,
- decided to make activities related to smoking,
- in which the training and the trainers were sufficient and sufficient visual,
- in which auditory and experimental materials were used in education,
- corrected wrongs as known correctly,
- has understood the damages of cigarettes to all systems,
- was well planned and education was sufficient,
- in which the drama activities make the activity more effective,
- was composed of teamwork and well academic level,
- in which the education materials contributed to the given training,
- can be applied to different participant groups.
- insufficient transfer of education to students,
- lack of concrete examples,
- lack of active participation,
- games and practices,
- re-explaining some issues,
- long-term and long words in the Latin language,
- insufficient physical conditions in the training room,
- inadequate visual materials.

## Discussion

The most important result of the Respiratory School project was to raise awareness among teachers about the development of COPD and changes in quality of life in long-term smoking in the context of the relationship between the respiratory system and smoking. By reaching the aim of theoretical and practical training given during education, the negative effects of smoking were transferred to teachers who were role models in society, and they have copied this role.

Moreover, negative opinions as 8% were found, such as:



In a study conducted by Perincek G among teachers; The age at first smoking was  $17.5 \pm 3.5$  years and the most common reason for starting smoking was curiosity (57%). Nicotine use among participants who smoked addiction was very low (43.5%). In our study, 26% of teachers smoked. In this context, the high level of smoking among prospective teachers may give the impression that the number of smoking teachers will be high in the future. Smoking was also found to be high among students who smoke in their families. In our study, the rate of smoking was high in the families of teachers who smoked (15).

In a study of primary school teachers investigating smoking prevalence and factors affecting smoking prevalence, 36.7% (n=793) of all participants were found to be smokers. The mean age at first smoking was  $18.2 \pm 4.5$  years and the mean duration of smoking was  $18.5 \pm 8.5$  years. The prevalence of smoking cessation was 28.8% and the prevalence of smoking was higher in men than in women (16). In the study conducted by Gencer et al., to determine smoking habits and behavioral behaviors related to this habit among teachers, a questionnaire about smoking habits was applied to 172 teachers working in a primary school. 50 (29.1%) of the teachers who participated in the survey smoked (17). In another study, 860 teachers who work in 21 primary schools in the city center of Kayseri were selected using a stratified random sampling method from 210 public schools and agreed to participate in the study to determine their behaviors and opinions. 31.5% of the teachers smoked, 54.2% of the teachers smoked more than 11 cigarettes per day, and 93.7% of the teachers smoked in the school areas. Of the teachers included in the study, 69.8% of those who informed their students about the health damages of cigarettes, and those who knew about the damages of cigarettes, 69.7% of those who knew about the law numbered 4207, 69.2% of those who thought it was the responsibility of the teacher to reduce the smoking rate. It was found that 75.2% of the participants in the seminar on the harms of smoking do not smoke. The study determined that non-smoking teachers had more positive attitudes towards smoking by students (18). Similarly, in our research, non-smokers focused on education, and increased awareness levels were higher.

The attitudes of teachers about the ban on smoking both indoors and in gardens of educational institutions were examined. The attitudes of teachers about the ban on smoking in educational institutions indoors and in gardens were examined. The change in smoking behavior of 545 (34.6%) teachers who answered two questionnaires was evaluated by all teachers of 33 high schools in the central district of Denizli before the

law (May 2008) and one year after (September 2009). At the end of one year, the teachers' quitting rate was 20.8% in the education group and 12.2% in the control group. Variables thought to be effective in smoking cessation: teachers' gender, age, smoking cessation education, dependence levels, smoking status of their spouses, and whether they support the law on smoking were analyzed (19). Coşkun et al. determined the smoking levels of teachers in Bursa and their opinions about the law prohibiting smoking in indoor areas, which started to be implemented in our country. Twenty-two questionnaire forms were distributed to all schools in Bursa. A total of 8291 teachers were included in the study. The smoking ratio of the males (n=3519, mean age  $40.6 \pm 0.1$ ) was 33.6%, and for the females (n=4772, mean age  $34.9 \pm 0.1$ ) was 25.4%. In response to the question 'What do you think about the prohibition of smoking in public indoor areas according to the Law on the Prevention and Control of Harms of Tobacco Products, which entered into force on 19 May 2008?', 75.8% of teachers answered it as a necessary law, while 14.3% stated they found the law unnecessary (20). When we compare the findings of these studies with the data from the Respiratory School project, they are in the same direction. In the Respiratory School project, branch and elementary school teachers were trained indiscriminately. Furthermore, the fact that the smoking rate among teachers is considerably high reveals how accurate it is in terms of the selection of the target audience in the project. In another study evaluating smoking habits among teachers in schools, the mean age of the participants was  $38.9 \pm 8.9$  years. When smoking habits were evaluated, it was found that 291 (44.1%) were smokers, 252 (38.2%) were nonsmokers, and 117 (17.7%) had stopped smoking. 43.2% of women and 44.8% of men were smoking. The data in the School of Respiration project are in the same direction, which makes it inevitable that the target audience should be teachers (21).

Within the scope of a project called 'Preventing Substance Addiction in Schools', guidance training, class/branch teachers, and informing about substance use and addiction. 508 guidance teachers, 2599 class / branch teachers, and 284 parents who participated in the training carried out within the scope of the Drug Addiction Prevention Project in schools were administered the first post test. The effectiveness of the training was measured by examining the difference between the total line numbers of the first test and the total line numbers of the last test. To check whether completion of the first test affected the effectiveness of the training, only the final test was applied to 15% of the participants in each training. The total number of questions correctly answered by the guidance

counselor, the class / branch teacher, and parents in the first and last tests increased. The highest increase in the number of correctly answered questions was observed between the first and last tests by class / branch teachers, parents, and guidance teachers, respectively. The difference between the groups was found to be statistically significant when the mean increase in the number of lines obtained in the first test was compared with each other. As the project output, it has been shown that the applied training increases the knowledge level of guidance teachers, class/branch teachers, and parents (22). Similar results were obtained in the Respiratory School project on cigarette addiction, and the difference between the first and last test scores of the teachers was significant. In particular, the effectiveness of the training was demonstrated by the first and last results of the test and other awareness surveys.

The training program implemented within the scope of the 'Respiratory School' project has achieved its goal. At the end of the training, it was found that participants gained more knowledge and behavior. Although approximately one-quarter of the participants were smoking, most of the participants, except for a small number of participants, were determined to quit smoking in the short term. The social aspects of such projects should be applied to all segments of society, considering the power of society, and contribute to our fight against smoking, which steals our silent and insidious health.

Since the post-test was conducted immediately after the training, the recall factor may have affected the findings of the study. This was taken into consideration as a limitation of the study.

### Suggestions

Carrying out the training to the vocational high schools and the families of the students there. To be held in a different and wider time than the seminar period. Raising awareness as a subject in the local and national press. Repeating this training to teachers in certain time periods. Dissemination in Turkey. Education of patients with COPD is planned for the continuation of the project. Repeating this training in schools with lung models. Choosing secondary and high schools as target groups.

### Conflict of Interest Statement

The authors have no conflicts of interest to declare.

### Ethical approval

This article does not contain any studies with human or animal subjects.

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### Availability of Data and Materials

Data available on request from the authors.

### Authors Contributions

MS: Project administration; Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Validation; Visualization; Original writing draft.

OO: Data curation; Formal analysis; Investigation; Methodology; Validation.

OC: Methodology; Validation; Visualization.

OO: Investigation; Methodology; Project administration; Resources; Supervision; Validation.

IG: Formal analysis; Investigation; Visualization; Writing-original draft.

SD: Resources; Supervision; Writing-review & editing.

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