The effect of smoking on respiratory functions in athletes

O efeito do fumo nas funções respiratórias de atletas

Serkan Aydin

Abstract

The aim of this study was to investigate the effect of smoking on respiratory functions in athletes. A total of 12 American football players with an age, height and body mass means of 22.50±1.62 years, 182.83±5.85 cm., 88.91±18.99 kg. voluntarily participated in the study. The participants were competitive players with at least five years of continuous training and competition experience. Respiratory functions of the athletes were measured with a Minispir hand-held spirometer. Forced Vital Capacity (FVC), Peak Expiratory Flow (PEF), Maximal Voluntary Ventilation (MVV) values were measured. Data were analyzed using IBM SPSS 26 package program. Because the distribution of the data was not normal, the Mann Whitney-U test and Spearman correlation test, a nonparametric test, were used to compare the data between the smoker and non-smoker groups. The significance level was accepted as p<0.05. Although numerically positive effects were found on the respiratory function of non-smokers compared to smokers, there was no statistically significant difference or correlation relationship between the data constituting these effects. As a result, it was found that the respiratory function of American football players who smoked cigarettes was lower than that of non-smokers. In line with these results, it can be stated that smoking has a negative effect on respiratory functions.

Keywords: Smoking. Respiratory Function. Sport. Performance.

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Resumo
O objetivo deste estudo foi investigar o efeito do tabagismo nas funções respiratórias de atletas. Um total de 12 jogadores de futebol americano com idade, altura e massa corporal médias de 22,50±1,62 anos, 182,83±5,85 cm, 88,91±18,99 kg participaram voluntariamente do estudo. Os participantes eram jogadores competitivos com pelo menos cinco anos de experiência contínua em treinamento e competição. As funções respiratórias dos atletas foram medidas com um espirômetro portátil Minispir. Foram medidos os valores de capacidade vital forçada (FVC), pico de fluxo expiratório (PEF) e ventilação voluntária máxima (MVV). Os dados foram analisados com o programa IBM SPSS 26. Como a distribuição dos dados não era normal, o teste Mann Whitney-U e o teste de correlação de Spearman, um teste não paramétrico, foram usados para comparar os dados entre os grupos de fumantes e não fumantes. O nível de significância foi aceito como p<0,05. Embora tenham sido encontrados efeitos numericamente positivos na função respiratória dos não fumantes em comparação com a dos fumantes, não houve diferença estatisticamente significativa ou relação de correlação entre os dados que constituem esses efeitos. Como resultado, constatou-se que a função respiratória dos jogadores de futebol americano que fumavam cigarros era menor do que a dos não fumantes. De acordo com esses resultados, pode-se afirmar que o fumo tem um efeito negativo sobre as funções respiratórias.


Introduction

It is stated that individuals who smoke are at greater risk for cardiovascular diseases (Šaranović and et all 2019) and unfortunately, 100 million people lost their lives due to the use of tobacco and tobacco products in the 20th century and it has been reported that this number will reach 1 billion in the 21st century (Çalışkan and Metintaş 2018; Giovino et all. 2012).

People who use tobacco products use them even though they are aware of the health risks of these products (Akl et all. 2013), and these products are also preferred among athletes despite their known negative effects on sportive performance (Nattiv et all. 1997; Wechsler et all. 1997). Pain in athletes is a limiting factor on sports performance (Deschamps et all. 2014; Hureau et all 2018), and although pain tolerance differs between beginners and professional athletes (Thornton et all. 2021), the positive effect of nicotine on hypothalamic
function, which causes pain reduction (Hoyt 2013; Bartík et al. 2023), may be thought to lead athletes to smoking (Marclay and Saugy 2010; Bartík et al. 2023). However, it has been reported that smoking has a negative effect on respiratory function and skeletal muscle and that these negative effects reduce exercise intolerance and muscle fatigue resistance (Darabseh et al. 2021; Darabseh et al. 2020; Wüst et al. 2008; Ajime, et al. 2021).

In the literature, there are studies examining the effects of smoking on respiratory function in sedentary and athletic individuals. While some of these studies concluded that smoking has no negative effect on respiratory function (Elshazly et al. 2020; Koubaa et al. 2015; Saiphoklang et al. 2020), there are studies reporting that it has a predominantly negative effect (Dugral and Balkanci, 2019; Šaranović et al. 2019; Taati et al. 2020; Darabseh et al. 2021; Bocalini et al. 2020).

The differences in the results of these studies reveal that the number of studies in this field should be increased. Exercise is beneficial for health (Ünveren et al. 2013), but the effects of exercise on respiratory function should be well defined, especially in smokers, there are a limited number of studies examining the effects of exercise on respiratory function (Nye et al. 2017). Although nicotine is said to increase attention and motor ability in studies examining the effects of nicotine (Heishman et al. 2010), nicotine intake and smoking should not be considered in the same framework. Ignoring other substances taken into the body during cigarette use may lead to incorrect evaluations, so it is thought that it is important to reveal the effects of cigarette use on respiratory functions by contributing to studies to be conducted in this field. In this respect, the aim of this study is to investigate the effects of smoking on respiratory functions of athletes.

**Methodology**

**2.1 Research Model**

This study was carried out with the approval of the Tekirdağ Namık Kemal University, Non-Invasive Clinical Research Ethics Committee (2023.146.07.11 numbered article). The study is observational in terms of the data collection technique, descriptive according to the causality relationship, and cross-sectional considering the timing relationship. Experimental research from quantitative research methods was used in the study.
2.2 Research Group

This study was carried out with voluntary participation of 12 licensed players of Tekirdağ Namık Kemal University American Football team. Participants were required to be regular players with a minimum of five years of consistent training and competition experience. The average sports experience was 5.1 years. All participants had provided written informed consent. The age, height and body mass means of the participants were 22.50±1.62 years, 182.83±5.85 cm., 88.91±18.99 kg. The conceptual framework of the study is about the effects of smoking on respiratory functions. Participants were divided into two groups: smokers and non-smokers.

2.3 Data Collection Tools

2.3.1 Height, Body Weight Measurements

The height, body weight, of the American football players who participated in the study was determined with the Inbody BSM-170 height measuring device and Tanita InBody 120 device. During the measurement, data were obtained by keeping the athletes' hands and feet motionless in contact with the measuring points.

2.3.2 Respiratory Functions Measurements

The device MIR MiniSpir hand-held spirometer was used to measure the respiratory functions of the athletes such as Forced Vital Capacity (FVC), Peak Expiratory Flow (PEF), Maximal Voluntary Ventilation (MVV).

2.4 Data Analysis

The data of the participants in the study were analyzed using IBM SPSS 24 package program. Test distributions of the variables according to the methods were examined. Normality of the distributions and homogeneity of the variances were determined by Shapiro-Wilks’s test. Mann Whitney-U test and Spearman correlation test were conducted to compare the respiratory function data between smoker and non-smoker athletes.
Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>n</th>
<th>Mean</th>
<th>±</th>
<th>Sum of</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (year)</td>
<td>Smoker</td>
<td>7</td>
<td>5.60</td>
<td></td>
<td>28.00</td>
</tr>
<tr>
<td></td>
<td>Non-Smoker</td>
<td>5</td>
<td>7.14</td>
<td></td>
<td>50.00</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>Smoker</td>
<td>7</td>
<td>5.71</td>
<td></td>
<td>40.00</td>
</tr>
<tr>
<td></td>
<td>Non-Smoker</td>
<td>5</td>
<td>7.60</td>
<td></td>
<td>38.00</td>
</tr>
<tr>
<td>Body Mass (kg)</td>
<td>Smoker</td>
<td>7</td>
<td>6.21</td>
<td></td>
<td>43.50</td>
</tr>
<tr>
<td></td>
<td>Non-Smoker</td>
<td>5</td>
<td>6.90</td>
<td></td>
<td>34.50</td>
</tr>
</tbody>
</table>

Table 1: Descriptive statistics of the participants
Source: Author

Descriptive statistics of the participants are given in Table 1. According to the descriptive statistics data presented in Table 1, age, height and body mass means of the participants were 22.50±1.62 years, 182.83±5.85 cm., 88.91±18.99 kg.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>n</th>
<th>Mean</th>
<th>±</th>
<th>U</th>
<th>Z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC (lt)</td>
<td>Smoker</td>
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<td>5.60</td>
<td></td>
<td>28.00</td>
<td>13.00</td>
<td>-.731</td>
</tr>
<tr>
<td></td>
<td>Non-Smoker</td>
<td>5</td>
<td>7.14</td>
<td></td>
<td>50.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEF (lt/sec)</td>
<td>Smoker</td>
<td>7</td>
<td>5.71</td>
<td></td>
<td>40.00</td>
<td>12.00</td>
<td>-.893</td>
</tr>
<tr>
<td></td>
<td>Non-Smoker</td>
<td>5</td>
<td>7.60</td>
<td></td>
<td>38.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MVV (lt/min)</td>
<td>Smoker</td>
<td>7</td>
<td>6.21</td>
<td></td>
<td>43.50</td>
<td>15.50</td>
<td>-.325</td>
</tr>
<tr>
<td></td>
<td>Non-Smoker</td>
<td>5</td>
<td>6.90</td>
<td></td>
<td>34.50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Respiratory function data of the participants
*p<0.05
Source: Author

The test scores of the respiratory function data of the two groups are given in Table 2. As a result of the analysis, no significant difference was found between the FVC (U= 13.00, p>0.05), PEF (U= 12.00, p>0.05) and MVV (U= 15.50, p>0.05) values of the groups. In the quantitative evaluation, it was found that the mean ranks of FVC, PEF and MVV values were higher in the non-smoking group.

<table>
<thead>
<tr>
<th>FVC</th>
<th>PEF</th>
<th>MVV</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC</td>
<td>1</td>
<td>.112</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.459</td>
</tr>
<tr>
<td>PEF</td>
<td>1</td>
<td>.410</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MVV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Correlation analyses of the respiratory function data of the participants
Source: Author

No negative or positive correlation was detected between the participants’ respiratory function data.
Discussion & Conclusion

The aim of this study was to investigate the respiratory functions of American Football team athletes who regularly participated in training in terms of smoking variable. Although there was no statistically significant difference between the Forced Vital Capacity (FVC), Peak Expiratory Flow (PEF), Maximal Voluntary Ventilation (MVV) values of the participants, it was observed that the respiratory function values of the non-smokers were higher. Therefore, it was concluded that non-smoking athletes had better respiratory functions.

In a study conducted on smoking and non-smoking men and women, it was found that FEV1, FVC and PEF values of men were higher than those of women (Crapo et all. 1981). It was observed that FVC and FEV1 values of sedentary non-smokers were higher than smokers (Saiphoklang et all. 2020). However, in a study conducted among young adults, it was found that smoking did not have a negative effect on lung function and such individuals were referred to as healthy smokers (Dugral and Balkancı 2019). In another study on young adults, smokers showed mild changes in lung morphology, lung inflammation and lung function, although they did not show chronic symptoms or abnormal lung function (Willemse et all 2004). It was found that FVC and FEV1 values of individuals exposed to cigarette smoke, called passive smokers, were worse than those who were not exposed to cigarette smoke (Goic-Barisic et all.2006). Willemse et al. (2004) reported that quitting smoking improves respiratory symptoms and bronchial sensitivity and increases lung function (Saiphoklang et al.2020).

Increases in PEF, FEV1 /FVC values of the participants were detected as a result of regular exercise (Koubaa et all. 2015). Decreased lung function and decreased cardiorespiratory capacity are observed in a sedentary life (Dunn et all. 1999). From this point of view, it is thought that the decline in respiratory function will be much higher when smoking is added to a sedentary life. Many studies have shown that the oxygen utilization capacity of sedentary smokers increases after regular exercise (Harmer et all. 2000; Daussin et all. 2008; Macfarlane et all.2006; Tjønna et all 2008). However, Jang et al. (2017) reported that smoking had no effect on maximum oxygen utilization capacity as a result of a study on taek-wondo athletes.

The inconsistency of the effects of smoking on respiratory function in studies on active athletes is a matter of debate, and increasing the number of studies in this field will eliminate this inconsistency. Karpovich & Hale (1951) reported reduced physical performance in smokers in the middle of the last century and this information was confirmed by the statement
that smoking cessation significantly improved physical performance in young men (Feinberg et al. 2015). In our study, the fact that there was an improvement in the respiratory function of athletes who exercised regularly supports this confirmation.

Considering that regular exercise training is an effective method to improve respiratory functions (Taati et al. 2020), it can be stated that the lack of difference between respiratory functions in the comparisons between smoking and non-smoking athletes is due to the healing factor of regular exercise. As a result, it was determined that the respiratory function of American football players who smoked was lower than that of non-smokers. In line with these results, it can be stated that smoking has a negative effect on respiratory function.

References


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