



Cigarette use among Greek athletes

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Summary

Background: Cigarette smoking is an important risk factor for cardiovascular disease and lung cancer. Exercise improves cardiovascular and pulmonary function and also may play an important role in encouraging people to give up smoking, when appropriate sporting activity is introduced. We investigated smoking habits among Greek students participating in sporting activities.

Methods: We interviewed 1003 volunteers with a mean age of 17.9 ± 0.2 years. They included 617 (61.5%) men and 386 (38.5%) women, participating in 30 different sporting activities. A specific questionnaire was used.

Results: Of the 1003 volunteers, 104 (10.4%) were current smokers who started smoking at the age of 17.3 ± 0.2 years and smoked 13.6 ± 0.7 cigarettes per day. Among males 9.1% and among females 12.4% were current smokers. Two-thirds (66.4%) of the smokers preferred Marlboro (45.2%) and Camel (21.2%) brands, respectively. Among males, volleyball, kickboxing, track & field and handball and among females, volleyball, dance, gymnastics, and basketball were associated with higher rates of smoking. Students involved in national and international competitions had significantly lower smoking rates.

Conclusions: Exercise may be related to a significantly lower prevalence of smoking among students. Smoking cessation programs should encourage sporting activity. Participation at high levels of competition may be significant in preventing the habit of smoking.

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Introduction

Cigarette smoking is responsible for more than 400,000 premature deaths annually in the USA. It is interesting to note that in 1990, one out of every five deaths was the result of smoking [1]. Cigarette smoking changes both the structure and function of central and peripheral airways, alveoli and capillaries, and the immune system of the lungs and 30% of coronary heart disease are attributable to tobacco [2].

Tobacco smoke contains more than 4000 chemicals, 60 of which are known to be carcinogenic. The most dangerous components identified in cigarette smoke are hydrogen cyanide, nicotine and carbon monoxide (CO) [3]. In sports, smoking induced elevation in the CO content of the blood reduces exercise tolerance and maximal aerobic capacity. It also increases the reliance on glycolytic metabolism during exercise. As a result, these factors contribute to earlier fatigue in smokers compared with nonsmokers who exercise [4].

Smoking is not only dangerous for human health but it also negatively affects the individual's quality of life. Sport activity is known to promote health and reduce the risk of lung cancer and heart diseases [2]. On the other hand, smoking cessation has significant benefits on health status including exercise tolerance. The extensive literature on the health benefits of cessation has been summarised by the US Surgeon General [5].

The purpose of this study was to investigate the epidemiological characteristics of tobacco use among Greek students participating in sporting activities, who were not professional athletes. Also, we set out to examine possible relations between smoking and the type of sport, sex, and level of competition.

Material and methods

From July 2001 to February 2003, we surveyed male and female students from Athens University participating in 30 different sporting activities. A 26 item, multiple-choice questionnaire was applied (Appendix). Testing was anonymous and on a volunteer basis. Only Greek students participated in the survey; those from other racial and ethnic groups were excluded. All students participating in the study were amateurs and not professional athletes.

The questionnaire was distributed by informed personnel to student-athletes at the Athens University of Sport Science. We recruited 1056 students with a response rate of approximately 95% (1003/

1056). The questionnaire took about 35 min to complete.

Applying the questionnaire, we identified current smokers, age of starting smoking, number of cigarettes smoked per day, Fagerstrom scale score, favourite brands, type of sport, and the level of competition engaged in by male and female students.

For the purposes of our analysis, we divided sports into two main categories: team sports (7 = baseball, basketball, handball, football, softball, volleyball, water polo) and individual sports (23 = archery, boxing, cycling, dance, fencing, gymnastics, horse riding, judo, karate, kayak, kickboxing, motocross, rowing, sailing, shooting, skiing, swimming, tae kwon do, tennis, ping pong, track and field, weight lifting, wrestling).

We also divided athletes according to the level of competition into three categories: regional level athletes participating only in sports activities included in university courses; national level athletes participating in national competitions, as well as in university sports activities and International level athletes participating in national and international competitions, as well as in university sports activities.

Statistics

Data collected on smoking habits were subjected to descriptive statistics including mean, standard error and percentages. Categorical data were compared using the χ^2 test. Each type was then divided according to the average duration of daily training (<3 and ≥ 3 h) and according to the level of competition in which they participated.

Results

Of the 1003 students-athletes interviewed, 617 (61.5%) were men and 386 (38.5%) were women. The mean age was 17.9 ± 0.2 years (range: 17–31 years). There were 104 current smokers (10.4%) including 56 men (9.1%) and 48 women (12.4%). The difference was not statistically significant (χ^2 test). Table 1 summarizes the characteristics of all the participants in the study. Males participating in the study were significantly younger and started smoking at a significantly younger age ($P < 0.01$). Most males were participating in team sports while most females were participating in individual sports. A significantly higher proportion of females was involved in national and international sports activities ($P < 0.05$).

Table 1 Demographics and descriptive statistics of all study participants

	Males (617, 61.5%)	Females (386, 38.5%)	Total (1003)
Smokers	56 (9.1%)	48 (12.4%)	104 (10.4%)
Non-smokers	561	338	899
Age (years)	16.9 ± 0.2 ^{***}	19.3 ± 0.2 ^{***}	17.9 ± 0.2
NS	16.5 ± 0.2 ^{***}	18.9 ± 0.3 ^{***}	17.4 ± 0.2
S	21.9 ± 0.6 ^{**}	22.5 ± 0.3 ^{**}	22.2 ± 0.4
Type of sport			
Individual	180 (29.2%) ^{****}	247 (63.9%) ^{****}	427 (42.6%)
Team	437 (70.8%) ^{****}	139 (36.1%) ^{****}	576 (57.4%)
Competition level			
Regional	478 (77.5%) ^{****}	237 (61.4%) ^{****}	715 (71.3%)
National	105 (17.0%) ^{****}	116 (30.1%) ^{****}	221 (22.0%)
International	34 (5.5%) [*]	33 (8.5%) [*]	67 (6.7%)

S, smokers; NS, non-smokers.

^{*} Statistically significant difference, $P < 0.05$.

^{**} Statistically significant difference, $P < 0.01$.

^{***} Statistically significant difference, $P < 0.001$.

^{****} Statistically significant difference, $P < 0.0001$.

Table 2 Smokers vs. non-smokers: age, competition level and type of sport in males and females

	Males ($n = 617$)		Females ($n = 386$)		Total ($n = 1003$)	
	S (%)	NS	S (%)	NS	S (%)	NS
Age	21.9 ± 0.6	16.5 ± 0.2	22.5 ± 0.3	18.9 ± 0.3	22.2 ± 0.4	17.4 ± 0.2
Competition level						
Regional ($n = 715$)	37 (6.0)	441	25 (6.5)	212	62 (6.2)	653
National ($n = 221$)	9 (1.5) [*]	96	15 (3.9) [*]	101	24 (2.4)	197
International ($n = 67$)	10 (1.6)	24	8 (2.1)	25	18 (1.8)	49
Type of sport						
Individual ($n = 427$)	23(3.7) ^{**}	157	30(7.8) ^{**}	217	53	374
Team ($n = 576$)	33 (5.4)	404	18 (4.6)	121	51	525

S, smokers; NS, non-smokers.

^{*} Statistically significant difference, $P < 0.05$.

^{**} Statistically significant difference, $P < 0.01$.

Table 2 shows the characteristics of the smokers vs. non-smokers with respect to age, level of competition and type of sport in males and females. A significantly higher proportion of females participating at a national level ($P < 0.05$) and in individual sports ($P < 0.01$) were smokers compared to males.

Table 3 shows the characteristics of smokers, including the numbers and percentages of smokers, of cigarettes smoked per day, the Fagerstrom scale score, the starting age of smoking, and the most popular cigarette brands. It also shows the smoking rates according to the type of sports activity, level of competition and the duration of training per session. A significantly higher proportion of male smokers was participating in team sports when

compared to females. The most popular brands were Marlboro and Camel in both sexes. The level of addiction to nicotine measured by the Fagerstrom scale score was 5.2 ± 0.2 for males and 5.1 ± 0.3 for females. The difference was not statistically significant.

Table 4 shows the numbers and percentage of smokers per specific sports activity. Percentages were calculated if the total number of participants as ≥ 10 per sports activity. Among males, volleyball, kickboxing, track & field and handball and among females, volleyball, dancing, gymnastics, and basketball were associated with the highest smoking rates. Overall volleyball, kickboxing, dancing, gymnastics and tennis are associated with the highest rates of smoking.

Table 3 Characteristics of smokers

	Males (n = 56)	Females (n = 48)	Total (N = 104)
Smokers	56 (9.1%)	48 (12.4%)	104 (10.4%)
Age	21.9 ± 0.6**	22.5 ± 0.3**	22.2 ± 0.4
Starting age	16.9 ± 0.3*	17.8 ± 0.3*	17.3 ± 0.2
Cigarettes/day	14.5 ± 0.9	12.5 ± 0.9	13.6 ± 0.7
Fagerstrom scale score	5.2 ± 0.2	5.1 ± 0.3	5.2 ± 0.2
Type of sport			
Individual	23 (41.1%)*	30 (62.5%)*	53 (51.0%)
Team	33 (58.9%)*	18 (37.5%)*	51 (49.0%)
Competition level			
Regional	37 (66.1%)	25 (52.1%)	62 (59.6)
National	9 (16.1%)	15 (31.3%)	24 (23.1%)
International	10 (17.8%)	8 (16.6%)	18 (17.3%)
Brands favoured			
Marlboro	26 (46.4%)	21 (43.8%)	47 (45.2%)
Camel	15 (26.8%)	7 (14.6%)	22 (21.2%)
Silk cut	2 (3.6%)	5 (10.4%)	7 (6.7%)
Davidoff	3 (5.4%)	4 (8.3%)	7 (6.7%)
Winston	3 (5.4%)	1 (2.1%)	4 (3.8%)
Lucky strike	1 (1.8%)	2 (4.2%)	3 (2.9%)
Stuyvesant	2 (3.6%)	1 (2.1%)	3 (2.9%)
Philip morris	2 (3.6%)	1 (2.1%)	3 (2.9%)
Karelia	0	2 (4.2%)	2 (1.9%)
Old hornborn	1 (1.8%)	1 (2.1%)	2 (1.9%)
Muratti	0	1 (2.1%)	2 (1.9%)
Gauloises	0	1 (2.1%)	1 (0.9%)
Victory	0	1 (2.1%)	1 (0.9%)
Prince	1 (1.8%)	0	1 (0.9%)

* Statistically significant difference, $P < 0.05$.

** Statistically significant difference, $P < 0.01$.

Discussion

Our study suggests that 10.4% of Greek students participating in sporting activities are current smokers. Our results are in accordance with another study [6], which suggests that 15.5% of the athlete population are smokers. That study examined 2447 males from 14 to 40 years, an age span similar to ours.

The percentage of smokers among athletes in our study was significantly lower compared to the studies of Serraino et al. [7] (21%) and Scwenk [8] (27.9%). This may be explained by the different geographical and target populations (high school vs. university students) studied compared to ours. In addition, Forman et al. [9] examined 1117 male high-school athletes in the Chicago area and found that 27.9% of them were smokers which is significantly higher, compared to our results.

Smoking rates in our study are significantly lower compared to the study of Steptoe et al. [10] showing that European university students from 13

different countries not participating in sports activities smoke more. In particular, smoking rates among Greek students ($n = 1468$) in that study [10] were 39.9% for males and 37.3% for females in 1990 which increased to 44% and 42.5%, respectively, in 2000.

Our findings show that Greek students participating in sporting activities smoke significantly less compared to the general Greek population which is 46.8% for males, 29% for females and 37.6% for the total Greek population (data from WHO http://www.cdc.gov/tobacco/global/gyts/GYTS_countryreports.htm).

Our results also show significantly lower rates of smoking among students-athletes (10.4%) compared to the general Greek population in northern Greece which is 59.5% for males aged 21–40 years old and 40.2% for females of the same age [11]. In addition, our results show significantly lower rates of smoking compared to high school students (29.6%) aged 17.5 ± 1.3 years, health care university students (40.7%) aged 22.4 ± 2.4 years, and

Table 4 Smokers by specific sports^a

	Males	Females	Total
Archery	0/1	0/0	0/1
Basketball	15/264 (5.7%)	9/76 (11.8%)	24/340 (7.1%)
Base-ball	0/2	0/0	0/2
Boxing	0/1	0/0	0/1
Cycling	0/1	2/3	2/4
Dance	0/0	3/16 (18.8%)	3/16 (18.8%)
Fencing	0/0	1/4	1/4
Football	11/141 (7.8%)	1/3	12/144 (8.3%)
Gymnastics	0/1	6/34 (17.6%)	6/35 (17.1%)
Handball	2/10 (20%)	1/16 (6.3%)	3/26 (11.5%)
Judo	0/1	2/3	2/4
Karate	1/3	0/1	1/4
Kayak	0/1	0/1	0/2
Kickboxing	3/13 (23.1%)	0/1	3/14 (21.4%)
Motocross	0/1	0/0	0/1
Skiing	0/0	0/1	0/1
Softball	0/0	0/2	0/2
Shooting	1/10 (10%)	0/5	1/15 (6.6%)
Sailing	1/2	0/2	1/4
Swimming	6/63 (9.5%)	4/69 (5.8%)	10/132 (7.6%)
Horse riding	1/2	0/0	1/2
Rowing	0/1	0/4	0/5
Track and field	7/33 (21.2%)	8/83 (9.6%)	15/116 (12.9%)
Tae Kwon Do	1/9	0/5	1/14 (7.1%)
Tennis	2/25 (8%)	3/8	5/33 (15.2%)
Ping Pong	0/7	1/7	1/14 (7.1%)
Volley-ball	4/11 (36.4%)	7/36 (19.4%)	11/47 (23.4%)
Water polo	1/9	0/6	1/15 (6.6%)
Weight lifting	0/1	0/0	0/1
Wrestling	0/4	0/0	0/4
Total	56/617 (9.1%)	48/386 (12.4%)	104/1003 (10.4%)

^a Percentages were calculated if the total number of specific sports participants was ≥ 10 .

the general population participating in sports (36.9%) aged 29.2 ± 9.6 years in northern Greece [11]. Similar findings were observed in a study of 849 medical students in Greece aged 22 ± 2 years, which showed that 33.2% of males and 28.4% of females were current smokers [12]. It is worth mentioning that in the above study [11], the percentage of smokers among Greek physicians aged 36.9 ± 8.2 years, who should be well aware of the effects of smoking on their health, was 44.9%. It should also be noted that anti-smoking campaigns targeting students have been running for several years, which suggests that a lack of information about smoking is not a valid explanation.

In addition, recent data from Northern Greece [13] show that smoking rates among 9276 high school students are 32.6% for males and 26.9% for females for a total of 29.9% with a mean age of 14.4 ± 1.9 years for males and 14.9 ± 1.6 years for females for starting smoking. In that study [13],

43% of the students started smoking before the age of 14 years.

Based on all of the above, we suggest that Greek students participating in sporting activities have significantly lower rates of smoking compared to the general Greek population or other groups of the same or younger age. It should be noted that approximately 30% of our study population were competitive athletes, who participated in regional and national competitions. It was first shown by Merrill et al. [14] that among 16,262 female and male athletes and non-athletes, athletes had a lower rate of smoking.

The rate of smoking for females was higher compared to males, but the difference was not statistically significant, however, this is not in accordance with other studies of the Greek population [10–13]. Perhaps this reflects the observation that over the past decades, men have been decreasing their cigarette consumption while women have become

more habitual smokers worldwide [2]. However, this should be interpreted with caution. Males start smoking at a significantly lower age and smoke more cigarettes per day compared to females. We found that the starting age of smoking was not different compared to students in another Greek study [11], which was 17.8 ± 2.0 years. Another study concerning Greek medical students showed that only 25% of the studied population started smoking before the age of 19 years [12]. We found that there is significant difference in the starting age of smoking in the general Greek population which is reported to be 15.6 ± 2.1 years.

The fact that the age of starting smoking among Greek students was 17.3 ± 0.2 years may be attributed to several factors. Firstly, at this age students are preparing to take university entrance examinations. These exams have a high social impact on high school students because of high family pressure to be accepted into a university program. Also, there is a high level of competition because of the limited number of positions offered. It must be noted that in Greece there are only state-run universities. In addition, stressful and intensive studying limits the time spent for training and physical activity, which may prevent smoking. Also, students at the age of 17 years adopt behaviours that may be considered as trendy or in-style. These factors combined, may stir a young individual to begin smoking in order to cope with stressful studying and/or be socially accepted by his or her fellow classmates and friends. Although this does not prove a direct link between smoking and sporting activity, it can be argued that stopping or reducing training in combination with stressful and intensive studying at this age may be a contributing factor to starting smoking for Greek teenagers.

Secondly, Greek teenagers may also be influenced by marketing techniques used by the tobacco industry. These techniques include direct and indirect advertising, such as outdoor advertising (billboards), press advertising, point-of-sale merchandising, free sampling, brand stretching (clothing, lighters, etc.), internet sites and celebrity sponsorships [15]. Other investigators [16,17] suggest that industry marketing has a greater impact on adolescent smoking behaviour than stressful examinations.

Greece is a producer and exporter of tobacco with significant revenues arising from the tobacco trade (<http://www.cdc.gov/tobacco/who/greece.htm>). Direct or indirect tobacco advertising is prohibited on TV and radio. In other media – cinemas or press – tobacco advertising is possible only if it carries a health warning: “Smoking seriously damages your health”. Tobacco product advertis-

ing is prohibited in health care facilities, schools and universities, youth centres and athletic facilities.

In our study, the most popular brands were Marlboro followed by Camel for both sexes. The most popular brands in Greece in the general population are Marlboro, Assos, Camel and Peter Stuyvesant [20]. In 2000, the market share for Philip Morris was 24.3%, BAT 16.3%, Papastratos 14%, JTI 9.5% and others 35.9% (http://www.cdc.gov/tobacco/global/gyts/GYTS_countryreports.htm).

The level of addiction to nicotine measured by the Fagerstrom scale score was not significantly different between males and females and in absolute measures it indicates an intermediate level of dependence on nicotine.

Thirdly, smoking is related to the level of competition since regional level athletes had a significantly higher proportion of smokers compared to national and international level athletes for both sexes. This may be attributed to the fact that as the level of competition increases, athletes are less likely to start smoking since it may affect their performance. Our findings are supported by other studies [6,13,18], which show a negative correlation between being an elite student-athlete and cigarette use. However, we found no significant differences in smoking rates among national and international athletes for both sexes and especially for males.

We also found that male students may smoke more if they participate in team sports while females smoke significantly more if they participate in individual sports. This may be attributed to the fact that a significantly higher number of males participating in the study were involved in team sports and a significantly higher number of females participating in the study were involved in individual sports. According to the literature, the type of sports activity in which athletes are engaged directly affects their smoking habits [19]. This may have implications for the type of exercise to include in smoking cessation programs.

We found that for males participating in volleyball, kickboxing, track & field and handball and for females participating in volleyball, dance, gymnastics, and basketball, smoking rates were higher. The available literature provides limited data concerning the relationship between specific sports and the prevalence of smoking. In one study [6], subjects not engaged in specific training had the highest prevalence of smoking, while the lowest prevalence was reported in endurance-trained athletes. The highest percentage (40.8%) of smokers was found among soccer players. In our study, only 7.8% of soccer players were smokers. Perhaps, the

large number of participants and the wider age range in the study of Dlin et al. [6] explain the differences.

A more extensive study is needed to determine the relation between specific sports and smoking habits. However, it is clear that sporting preference is related to sex and thus possible relations between specific sports and smoking should be investigated on this basis. Based on our results, we cannot suggest which specific sporting activity is closely related to smoking and thus should be avoided in smoking cessation programs. Since regional athletes have higher smoking rates, a further investigation regarding sporting activities and smoking habits in that group is needed.

In our understanding, smoking status is not significantly affected by team or individual sporting activity or the type of sport involved. According to our results, the level of competition seems to be a significant factor affecting the smoking rates. This may be translated into personal goals, objectives and physical performance demands not only for athletes but also for the general population. Athletes at a high level of competition probably smoke less because they are focused on achieving their personal goals. Therefore, when examining the effect of involvement in sports on preventing or stopping smoking, it is probably more important to focus on personal goals and demands involved in sporting activity and life in general than on the specific type of sports. However, sports activities in general should be encouraged for all smokers.

One limitation of our study is that we did not collect data to analyze the reasons for a non-smoking or low-smoking status among participants in the study. Also, we do not have data to determine the percentage of students that never smoked versus those that quit smoking during the course of their participation in sports. Such data could have shed more light on the relationship between sporting activities, exercise and smoking.

Conclusively, our study shows that sporting activity among Greek students is related to significantly lower smoking rates compared to the general Greek population, to an age-matched Greek population and to students not participating in sporting activities. Sporting activity especially at a highly competitive level may be a significant tool to prevent or help to stop smoking among students. Thus, in the struggle against smoking (prevention or cessation), sporting activity and exercise may have an important role. However, there is insufficient evidence to recommend exercise as a specific aid to smoking cessation as more studies are needed with larger sample sizes for a definitive conclusion [21].

Appendix. Questionnaire on the smoking habits of people engaged in sports

1. Age --
2. Sex --: male --; female --
3. Member of a club --
4. Affiliated to which federation --
5. Sports practiced --
6. Specialty --
7. Level of sport practiced --
1-departmental 2-regional 3-national
4-international 5-amateur 6-professional
7-sport-studies 8-student 9-Olympic
8. Number of years you have been participating
1. <5 years, 2. between 5 and 10 years,
3. more than 10 years.
9. Do you take part in any other special function?
1-club manager --; 2-coach --; 3-federation
manager --4-club doctor --; 5-referee --;
6-other --
10. Does it bother you when other people are smoking?
Yes --; no --
11. If yes when?
1-before exercise 2-during exercise 3-after
exercise
12. Do you smoke?
1-yes, 2-no, 3-ex-smoker
13. Ex smoker how long ago did you stop? --
14. If you are an ex-smoker why did you stop?
1-own will, 2-illness, 3-excess weight, 4-fear
of illness, 5-on your doctor's advice, 6-trainer's
advice, 7-lowered performance, 8-recovery
problems, 9-other reasons (state precisely).
15. If you are a smoker at what age did you begin smoking? --
16. How many cigarettes do you smoke a day?
1-5 --, 6-10 --, 11-15 --, 16-20 --, 20+ --
(respond exactly).
17. What brand of cigarettes do you smoke? --
18. Reply to all questions so that we can calculate the exact amount of dependence.
 - 1 How many cigarettes do you smoke per day?
Less than 15 ____, 15-25 ____, more than
25 ____.
 - 2 What is the nicotine level in your cigarettes?
Less than 0.8 mg ____, 0.8-1.5 mg ____,
more than 1.5 mg ____.
 - 3 Do you inhale? Never ____, sometimes ____,
always ____.
 - 4 Do you smoke more in the morning than the
afternoon? Yes ____1, no ____0.
 - 5 When do you smoke your first cigarette?
In the first 1/2 h following getting up
____1, ____0.

- 6 Which cigarette do you rely on most of all?
First ___1, other ___0.
- 7 Do you still smoke if bedridden with flu, angina, etc.
Yes _____1, no ___0.
- 8 Do you find it difficult not to smoke in forbidden places (cinema, waiting room, trains, planes, etc.)
Yes ___1, no ___0.
- Total (adapted from Fagerstrom's Test).
19. Why do you smoke?
1-relaxation/pleasure ____, 2-taste of tobacco ____, 3- to diminish anxiety/calm down ____, 4-habit ____, 5-the need ____, 6- to relieve boredom ____, 7-as a treat ____, 8- stimulation, 9- other reasons: ___

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