

Running and Its Influence on Smoking Habits

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Objective. To investigate whether running influences smoking habits.

Design. Study of cases and controls, with 1:1 pairing. Retrospective longitudinal observational study.

Setting. Primary care. City of Toledo, Spain.

Participants. Cases: 48 healthy volunteer runners of 47 ± 7.8 years of age. Controls: 48 healthy subjects, paired by gender and year of birth, chosen at random from the medical list assigned to the medical researcher.

Principal measurements. Smoking habits and alcohol consumption in grams per week using a questionnaire, weight, height, blood pressure, and heart rate at rest. The odds ratio (OR) was obtained on the proportion of subjects who smoked or smoked at some time, those who continued smoking and the probabilities of giving up tobacco in each group.

Results. The OR of the proportion of subjects who smoked or had smoked between the groups of runners (54.2%) and controls (70.9%) was 0.486 (95% confidence interval [CI], 0.205-1.149; $\chi^2=2.8$; $P=.093$). The OR for continuing the habit between groups of runners (8.4%) and controls (41.7%) was 0.127 (95% CI, 0.035-0.456; $\chi^2=14.0$; $P=.0002$). In the group of runners, 45.8% had stopped smoking, as well as 31.2% of the controls (OR=7.85; 95% CI, 1.89-32.52; $\chi^2=11.8$; $P=.0007$); 50% of the runners who smoked had given it up since starting to run and 76.9% of these had given it up just at the time of starting to run.

Conclusions. There is a negative association between running and tobacco. If a smoker decides to run regularly he/she has high probabilities of giving up smoking and continue to do so.

Key words: Running. Tobacco. Case-control study.

INFLUENCIA DE LA CARRERA A PIE SOBRE EL HÁBITO TABÁQUICO

Objetivo. Investigar si la carrera a pie influye sobre el hábito tabáquico.

Diseño. Estudio de casos y controles, con emparejamiento 1:1. Observación longitudinal retrospectiva.

Emplazamiento. Atención primaria. Ciudad de Toledo.

Participantes. Casos: 48 corredores voluntarios sanos de $47 \pm 7,8$ años de edad. Controles: 48 sujetos sanos, emparejados por sexo y año de nacimiento, elegidos al azar entre la población adscrita al médico investigador.

Mediciones principales. Hábito tabáquico y gramos semanales de alcohol mediante cuestionario, peso, talla, presión arterial y frecuencia cardíaca de reposo. Se obtuvieron las *odds ratio* (OR) de las proporciones de sujetos que fumaban o habían fumado alguna vez, de los que seguían fumando y de las probabilidades de abandono del tabaco de cada grupo.

Resultados. La OR de la proporción de sujetos que fumaban o habían fumado entre los grupos de corredores (54,2%) y controles (70,9%) era de 0,486 (intervalo de confianza [IC] del 95%, 0,205-1,149; $\chi^2 = 2,8$; $p = 0,093$). La OR para continuación del hábito entre los grupos de corredores (8,4%) y controles (41,7%) era de 0,127 (IC del 95%, 0,035-0,456; $\chi^2 = 14,0$; $p = 0,0002$). En el grupo de corredores había abandonado el tabaco el 45,8% y en el de controles, el 31,2% (OR = 7,85; IC del 95%, 1,89-32,52; $\chi^2 = 11,8$; $p = 0,0007$). El 50% de los corredores que fumaban lo había dejado desde que comenzó a correr y el 76,9% de éstos lo había dejado justo en el momento de comenzar a correr.

Conclusiones. Hay una asociación negativa entre carrera a pie y tabaco. Si un fumador decide comenzar a correr regularmente, tiene muchas probabilidades de dejar de fumar y mantenerse así.

Palabras clave: Carrera a pie. Tabaco. Estudio casos-contróles.

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A commentary follow
this article
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Introduction

Tobacco appears to have an adverse effect on sports performance¹ and, although in intense efforts the effects of nicotine on the body at rest appear to be neutralised,² the rest of the adverse effects on physical performance is more obvious with the increase in the intensity of the effort.³

Accordingly, it appears that running, which is an intense effort, should be incompatible with the tobacco habit and could be used as an aid to quit smoking. However, there are few studies on the association between running and the tobacco habit. Only 2 transverse observational studies^{4,5} have been published on this association, carried out on participants in running track competitions. In the first,⁴ 428 Swiss women runners, participants in a popular run of 16 km, were studied by means of a questionnaire and a positive association was found between the running habit and giving up smoking, although the aim of the study was not looking for this association. In the second,⁵ 688 men and 725 women from the United States were studied, participants in a 10 km running competition, by means of a questionnaire, with an objective that was not looking for this association, although it did find that 81% of the men and 75% of the women who smoked when they started to run had given up smoking when they started to practice recreational running. Also, among those who continued running one year later (89% of the men and 79% of women), it was significantly more common to have given up smoking than it was between those who had now stopped running.

Therefore, there is no study which has specifically investigated the influence that the habit of running regularly can have on the smoking habit.

In view of all this, the objective of the present study was to investigate the influence of running on the tobacco habit, with the hypothesis that people who run regularly smoke less and to run helps them give up smoking.

Subjects and Methods

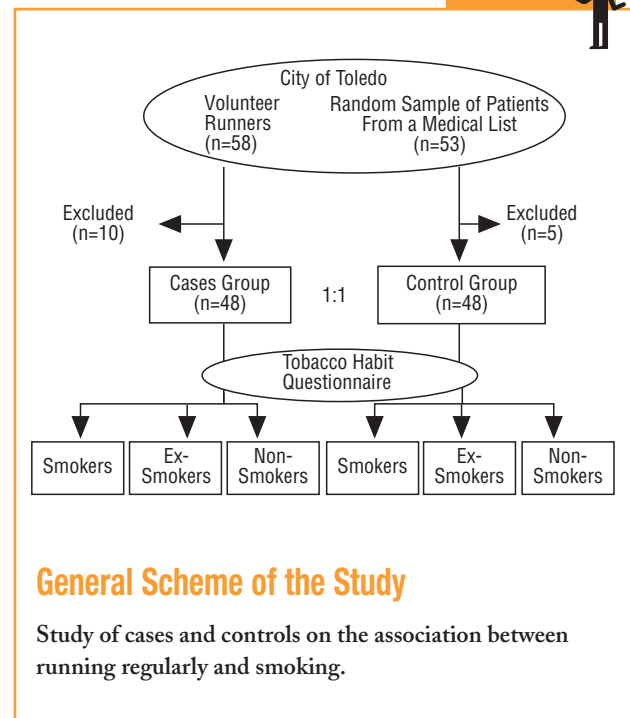
Design and Scope of the Study

It is an observational, longitudinal, and retrospective case and control study, with 1:1 pairing, carried out in the city of Toledo, Spain.

Study Population

Volunteers from a recreational running association, where a medical examination was performed which included questions on life habits (tobacco, alcohol and exercise, and measurements of weight, height, blood pressure, and heart rate at rest, with the inclusion of 58 runner subjects. Of these, 10 were excluded due to a history of high blood pressure (3 subjects), diabetes (4 subjects),

Material and methods



cardiac disease (2 subjects), or who had been running for less than 1 year (1 subject). Of these 10, 8 were ex-smokers and 2 were non-smokers. Therefore, this left 48 health runner subjects to make up the cases group.

The control group was made up of healthy subjects, paired by gender and year of birth, chosen at random (using a random number table) from the patient population assigned to the study medical researcher. Of the subjects initially chosen, 5 were excluded, due to chronic obstructive pulmonary disease (COPD) (1 subject), high blood pressure (HBP) (2 subjects), and diabetes (1 subject). Of the 5, 3 were smokers and 2, ex-smokers, and were replaced by reserve subjects also chosen at random.

Measurements

The following questions were asked in both groups: are you or have you been a smoker? Since when? Until when? How much do you or did you smoke?

Also, the weight, height, blood pressure (BP), and heart rate (HR) at rest were measured, as well as the questions on the alcoholic drinks they consumed in a week and the quantity.

The weight of the subjects was measured without shoes and with light clothes, and without metal objects in their pockets, on standard clinic scales. The height was also measured without shoes, with the measure incorporated in the scales, and with the head in a position where the tip of the nose was aligned with ear lobe. The mean body mass index (BMI) was calculated using the height and weight by dividing the weight in kilograms by the square of the height in metres. The BP was measured on the right arm, with a mercury-filled sphygmomanometer, in the sitting position after having been in this position for more than 3 minutes, in accordance with the recommendations as regards this. The heart rate at rest was measured in the same position, af-

ter the BP, by counting the number of beats in 15 s and multiplying it by 4.

The runners were also asked the following questions: When did you start to run? How many days per week do you run? How long does the run last? On a scale of 1-10, what is the intensity?

Validation of the Questionnaires

The questions on tobacco appeared in a questionnaire which was returned by 41 subjects (24 cases and 7 controls; 42.7%), for a test-retest evaluation of the responses, with a correlation of 1 for the smoker, ex-smoker or non-smoker state; 0.95 for years smoking; 0.96 for the number of cigarettes smoked per day, and 0.99 for the years since giving up tobacco.

Also, the questions asked on running were returned in 18 cases (37.5%), for a test-retest evaluation of the responses, with a correlation of 1 for the runner state; 0.88 for the years carried out running; 0.84 for the weekly frequency which they do it; 0.15 for the duration of the session; and 0.38 for the subjective intensity by which they ran.

Statistical Analysis

For the statistical analysis of the data the computer program STATA, version 6.0 was used. The proportion of subjects who smoked or had smoked at some time, as well as those who currently smoked, were compared between the 2 groups by calculating the odds ratio (OR) by the method of Mantel-Haenszel. The OR of the probabilities of giving up smoking of each group was also calculated. The means and standard deviations (SD) were obtained on the number of years of the smoking habit, the years since giving up tobacco of the ex-smokers, the number of cigarettes per day smoked by the ex-smokers, the number cigarettes per day smoked by those who had smoked sometime, the number of grams of alcohol consumed per week, the BMI, the systolic and diastolic BP levels and the HR at rest. All these parameters were compared between groups using the Student *t* test for independent samples and the Mann-Whitney U test when they did not comply with the rules of normality, and the variances.

In the runners group, the Pearson *r* correlation between the number of years they had been running and the number of years since the ex-smokers smoked was obtained. The proportion of runners who had given up smoking since they started running and those who gave up smoking at the time of starting to run, were also obtained.

Results

Each group had a sample of 47 men and one woman, with a mean age of 47 ± 7.8 years (range, 26-66 years). The principal characteristics of the 2 groups, as well as their comparison, are shown in Table 1.

The runners continued the habit of running for a mean of 11.4 ± 7.7 years (range, 2-32 years). They ran for 63.7 ± 9.8 minutes (range, 45-90

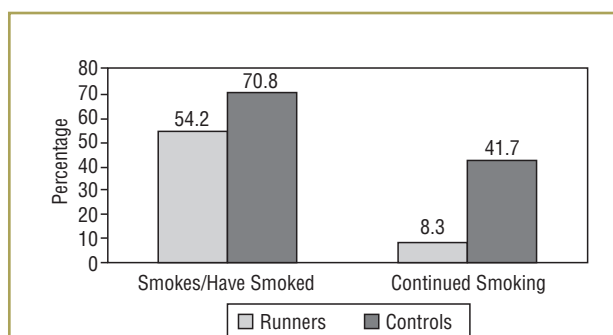


FIGURE 1

Proportion of subjects who have smoked at some time of their lives and who continue smoking in the 2 groups.

min), with a frequency of 2-7 days per week (median, 5 days) and an intensity of 4-8 (median, 5) on a scale of 1-10.

The proportion of smoker or ex-smoker subjects in both groups is shown in Figure 1. The OR of the comparison between the 2 groups was 0.486 (95% confidence interval [CI], 0.205-1.149; $\chi^2=2.81$; $P=.0934$).

It also shows the proportion of subjects who continued smoking in both groups, whose OR for the comparison was 0.127 (95% CI, 0.035-0.456; $\chi^2=14.07$; $P=.0002$). Among the runners, 22 subjects (45.83%) had given up smoking, against only 14 (29.17%) in the control group (OR for the comparison 7.85; 95% CI, 1.897-32.526; $\chi^2=11.89$; $P=.0007$). Of the 26 smoker or ex-smoker runners, 13 (50%) had given up smoking just at the time of starting the habit of running. The association between the habit of running and giving up tobacco gave a correlation

TABLE 1 Principal Characteristics of the Two Groups and Their Comparisons

Variable	Runners	N	Controls	N	P
Smokers	8.4%	4	41.7%	20	$\chi^2=14.22$; $P=.001$
Ex-smokers	45.8%	22	29.2%	14	
Non-smokers	45.8%	22	29.2%	14	
Years as smoker	18.7 ± 8.7	26	23.8 ± 9.8	34	$t=2.07$; $P=.0210$
Years as ex-smoker	14.3 ± 8.5	22	12.6 ± 12.5	15	$z=-0.99$; $P=.3214$
Cigarettes/day	22.5 ± 16.6	26	22.4 ± 13.9	34	$z=-0.203$; $P=.8375$
Grams of alcohol	91.58 ± 91.63	48	95.86 ± 161.95	46	$z=1.46$; $P=.1420$
BMI	25.01 ± 2.97	48	27.43 ± 4.02	48	$z=3.17$; $P=.0015$
SBP	128.39 ± 16.63	48	129.5 ± 14.17	48	$t=0.35$; $P=.3636$
DBP	82.72 ± 9.00	48	82.30 ± 9.03	48	$t=0.23$; $P=.5911$
HR at rest	53.80 ± 11.51	47	72.19 ± 13.08	42	$t=7.04$; $P=.0000$

*BMI indicates body mass index; SBP, systolic blood pressure; DBP, diastolic blood pressure; HR, heart rate.

of $r=0.4564$ ($P=.0328$) between the years of running and those of the ex-smoker in the ex-smoker runners.

Discussion

To run regularly can be a good aid to giving up smoking, at least in men, as shown by, the greater number of subjects who had given up tobacco in the runners group compared to the control group, and that the runners in this study, are 9 times more likely to have given up smoking than the controls, the significant correlation between the years of running and the years of being an ex-smoker, more than 75% of these having given it up on deciding to adopt the running habit.

The most obvious explanation for this is that running is an exercise of higher intensity than those used in previous studies carried out on this subject,^{6,7} that it is certainly incompatible with the restrictions on the physical capacity which tobacco produces in smokers,^{3,8-11} although it could also be due to the general concern for health itself leading to, on the one hand, running regularly, and on the other, giving up smoking. To run regularly requires the oxygen transport system to function better than in other types of exercises and the difficulties that tobacco imposes on oxygen transport^{10,11} perhaps makes running a more laborious effort for those who run that it obliges them to opt for 1 of the 2 habits.

The clinical trials carried out up until now to evaluate whether physical exercise can help giving up smoking have

not demonstrated that it produces a higher rate of stopping smoking between those who receive intervention by exercises,^{6,12} except in women who do vigorous exercise.⁷ This lack of response could be due to, on the one hand, that the exercise used may be of an intensity which makes the smoking habit incompatible with the increase in the level of physical activity and, on the other hand, that the subjects chosen for these studies may not have been motivated for one of the conducts or for neither of them, since stopping smoking as well as increasing the level of physical activity are two changes of conduct for which there has to be a motivational state which considers these two possibilities.

A weakness of this study may be the collecting of both habits using a questionnaire. However the test-retest evaluation performed on the questions which collected the 2 habits demonstrated a good reliability. The questions on tobacco had correlations, between the 2 questionnaires carried out on the same people, of 0.95-1, since everyone answers whether they are a smoker, ex-smoker, or have never smoked and they usually remember, approximately, when they started to smoke, when they gave it up and how many cigarettes they smoked. The questions on running also had correlations between the 2 questionnaires of between 0.84 and 1, although the correlations on the duration of the sessions and the intensity are lower and not significant, as they are 2 characteristics of the exercise which vary a lot from one day to the next and the questions reflect the mean of the week in which the question was asked. But this is irrelevant for the running habit, since all the responses to the 2 questionnaires of the test-retest gave durations higher than 45 minutes and intensities of 4, which means that the running habit was true in all of them, that the years of running and the frequency of doing it recorded well, and that the duration and intensity, although with variable responses, reached magnitudes which indicated intense exercise. This was also corroborated by the differences between the runners and the controls in the BMI and the HR at rest.

Another weakness could be the lack of representation of the controls, which were not chosen from the whole population of the city of Toledo, but only from a part of it. But on pertaining to the same doctor and subjected to the same environmental influences as the cases, it is highly probable that they have the same rates of ex-smokers, or even more, than the rest of the people with the sedentary life of this age and gender in the city.

The runners and controls belonging to the same city could be a strong point as it means they may have been subjected to the same environmental influences as regards habit changes and, possibly, may have also been subjected to similar influences from their family doctors. This increases the probability that running has been the factor which has influenced the giving up of tobacco.

In conclusion, it can be said that there is a negative association between the habit of running and smoking, in such

Discussion Key points



What Is Known About the Subject

- Tobacco negatively influences physical performance.
- Among the subjects who take part in popular running there is a high proportion of subjects who state that they have given up smoking.
- Clinical studies carried out with exercise programmes for giving up smoking have had little success.

What This Study Contributes

- There are more ex-smokers among those who practice running regularly than the rest of the population.
- Many subjects start running to give up smoking.
- There is incompatibility between intense exercise such as running and the smoking habit.

a way that if a smoker decides to start running regularly he/she has a higher probability of giving up tobacco and continue not smoking.

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COMMENTARY

Interventions to Stop Smoking: Expectations and Methodology Problems

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The tobacco habit is one of the biggest public health problems in our country. To smoke is a significant risk factor of cardiovascular diseases, cancer and hypertension, and one of the principal causes of premature death in the industrialised countries. Stopping smoking prolongs life and reduces morbidity.¹

Many attempts to stop smoking are made without help, but only 2%-4% of cases continue after 12 months of abstinence. The attempts without help, particularly by using a combination of behavioural orientation and nicotine replacement therapy (NRT), or with bupropion, can improve the success rate, but these remain low¹ and are,

for example, 14%-20% with NTR depending on its form.² The use of physical exercise as an additional aid to stopping smoking is very attractive, since physical exercise also reduces the cardiovascular risk.³ The article commented on evaluates the influence of running on continuing the tobacco habit using cases-controls methodology. The choice of running is very appropriate, from a cardiovascular point of view, as it is a vigorous aerobic exercise (except for the absence of fast running, absent in the sample, given that the minimum duration was 45 minutes), and is the type of exercise that is more clearly associated with cardiovascular protection.³

Key Points

- The currently achieved levels of tobacco abstinence need to be improved.
- Running is correlated with a lower incidence of smoking and a higher probability of giving it up.
- The inverse relationship has been published (stopping exercise induced by smoking), which is of interest in the design of interventions.
- Intervention studies would be required to reach firm conclusions on exercise as an aid to stopping smoking.

The results of the article clearly show that runners are less likely to smoke (8.4% current smokers among runners as opposed to 41.7% among controls) and that they are more likely to give up the habit in both cases (45.8 as opposed to 31.2%), with highly significant differences.

The present study has limitations due to its observational case-control methodology, despite the correct choice of controls, and it is hoped that the confounding factors have been balanced where possible. In particular, it is the possibility, indicated by the authors in the Discussion section, that the concern for health leads, on the one hand to running and, on the other, to stop smoking. This limitation is inevitable in a case-control study and even in an intervention study it would not be completely free from it. Running requires the voluntary intervention of the patient, therefore, the subjects who are less concerned about health could withdraw from the programme due to the effort required, and it is expected that these less motivated subjects were also more inclined to keep on smoking or fall back into the habit.

As a potentially important detail for effort activities in sport and the cessation of smoking in daily practice and for future investigations, the opposite effect to that described in this article can also be produced, since a correlation has been shown between smoking and giving up sport, at least in adolescents.⁴ This finding serves as a reminder of the frequent association of healthy conduct with the unquestionable interest to design interventions (the more factors the better) and for the interpretation of observational results (care with multiple associations of favourable and unfavourable lifestyle factors).

In future studies, attention should be paid to several points. On the one hand, it would be advisable to evaluate the effect of other types of exercise, particularly aerobics. Differences in the frequencies of smoking habits have been found in Norwegian adolescents not only depending on the level of physical activity and sport activity, but also

on the sport activity carried out.⁴ The frequency of the exercise was inversely related to that of smoking, but the participants in sports which require less effort, particularly bodybuilding and fighting sports, smoke more per day than those who do not participate in sports. Given that interventions on habits need the active and prolonged cooperation of the patient, to be able to offer a wider range of possible types of exercise would help in the success of these programmes.⁴

Intervention studies would need to be carried out to arrive at a firm conclusions on exercise as an aid to tobacco abstinence. On the one hand, only one of the 11 trials included in the current version of the review of the Cochrane Collaboration "Interventions with exercises to give up the smoking habit"¹ provides evidence on how exercise helps to stop the smoking habit. On the other hand, all except one of the other trials were too small to conclude that intervention was ineffective, or they did not include an intervention capable of achieving the desired level of exercise. The authors recommend trials with bigger sample sizes, sufficiently intense interventions, control groups with the same level of contact and measures of complying with the exercises, as well as an additional study to show the relationship between the different intensities and times of intervention exercises, and their effects on tobacco abstinence, and the basic processes and desires to smoke. We would also, humbly, insist on recommending (perhaps not in the same study), an evaluation on the differential effects of the types of exercises to be able to offer a list of programmes adapted as near as possible to the preferences of the patient, thus optimising compliance in the long term, since this is the big problem with all the interventions of health promotion which deal with lifestyle.

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