# Correlation between the subjective perception of the lifestyle and eating habits and the objective result of the lipid profile and anthropometric values in amateurs runners of Autonomous City of Buenos Aires

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## ABSTRACT

**Introduction**: in Argentina, 55% of those over 18 years of age do insufficient physical activity. A diet with high energy density and low intake of fruits, vegetables and whole grains prevails. The increase in popular sport promotes a favorable change. **Material and methods**: Analytical, correlational study conducted in ACAB from 2016 to 2018 to correlate the subjective perception of lifestyle and eating habits with the objective results of the lipid profile and anthropometric values in 46 amateur street runners. These instruments were used: GPAQ 2.0, Questionnaire on lifestyle practices and beliefs, DHQ I, ISAK and lipidogram. **Results**: the CC and the ICC were of low cardiometabolic risk. BMI was normal. 67% and 76% had desirable levels of TCol and LDLc, 48% high HDLc and 96% normal TG. The eating habits were adequate, although in 54% it was inappropriate for sweets and fats. Inadequate consumption of snacks and beverages were significant in relation to BF% and BMI, HDLc and ∑6s with lifestyle. The value of METs was high. 85% presented a Healthy Lifestyle. **Conclusion**: men were more overweight than women but better HWI, WC, BF% and Σ6s values, and women, better lipid profile. The majority presented adequate consumption, except for sweets and fats in all and refreshments in women. There was a significant correlation between refreshments and drinks and %BF and life style scores with cLDL, cHDL, BMI and ∑6s.

## KEYWORDS

Running; Life Style; Eating; Anthropometry; Lipid

## Correlación entre la percepción subjetiva del estilo de vida y hábitos alimentarios y el resultado objetivo del perfil lipídico y valores antropométricos en corredores amateurs de la Ciudad Autónoma de Buenos Aires

## RESUMEN

**Introducción**: en Argentina, el 55% de los mayores de 18 años realiza actividad física en forma insuficiente. Predomina una dieta con alta densidad energética y escasa ingesta de frutas, verduras y cereales integrales. El

aumento del deporte popular promueve un cambio favorable. **Material y métodos**: Estudio analítico correlacional realizado en la Ciudad Autónoma de Buenos Aires, de 2016 a 2018 para correlacionar la percepción subjetiva del estilo de vida y hábitos alimentarios con los resultados objetivos del perfil lipídico y valores antropométricos en 46 corredores de calle aficionados. Se utilizaron estos instrumentos: GPAQ 2.0, Cuestionario sobre prácticas y creencias de estilo de vida, DHQ I, ISAK y lipidograma. **Resultados**: la CC y el ICC fueron de bajo riesgo cardiometabólico. El IMC fue normal. 67% y el 76% tenían niveles deseables de Col Total y LDLc, 48% HDLc alto y 96% TG normales. Los hábitos alimentarios fueron adecuados, aunque en un 54% fue inadecuado para dulces y grasas. El consumo inadecuado de snacks y bebidas fue significativo en relación con el % GC y el IMC, HDLc y ∑6 pliegues con el estilo de vida. El valor de los MET fue alto. El 85% presentó un Estilo de Vida Saludable. **Conclusión**: los hombres tenían más sobrepeso que las mujeres, pero mejores valores de ICC, CC, % GC y Σ6 pliegues, y las mujeres, mejor perfil lipídico. La mayoría presentó un consumo adecuado, excepto de dulces y grasas en todos y refrescos en las mujeres. Hubo una correlación significativa entre refrigerios y bebidas y % GC y puntajes de estilo de vida con cLDL, cHDL, IMC y ∑6 pliegues.

## PALABRAS CLAVE

Correr, Estilo de vida, Conducta alimentaria, Antropometría, Lípidos

## INTRODUCTION

In Argentina and in the world, the increase in longevity and the increase in popular sports have been determining factors in a change in lifestyle. Running is a growing phenomenon in Argentina [1]. However, the reality of the health level of the general population quantifies alarming data: according to the latest National Survey of Risk Factors, 64.9% of the population over 18 years, had an insufficient level of physical activity [2]. From the perspective of eating habits, in Latin America and Argentina, over the last decades a nutritional transition has been developing towards a diet with high energy density and a high consumption of saturated fats, sugars and sodium and processed products and a low consumption of fruits, vegetables and whole grains which predisposes to the appearance of risk factors for chronic non-communicable diseases [3].

There is an increased need to reverse national and international statistics. Carrying out anthropometric and lipid profile determinations together with the lifestyle and eating habits of the population, allow the detection of cardiometabolic risk markers, which are relatively easy to perform in Primary Health Care [4]. In Argentina, there are only a few investigations on this particular group and has not been found enough evidence that jointly addresses the variables studied.

The general objective of this research was to correlate the subjective perception of lifestyle and eating habits with the objective results of the lipid profile and the anthropometric values associated with cardiometabolic risk in amateur street runners of both sexes. The specific objectives were:

- Characterize the sample studied according to sex and age range
- Determine their anthropometric profile: Body Mass Index (BMI), Waist-Hip Index (HWI), Waist Circumference (WC), Sum of six folds (∑6s) and Percentage of body fat (BF%)
- Determine their lipid profile in the blood
- Evaluate their eating behaviours
- Estimate the frequency, duration and intensity of physical training and recreational activity
- Know the practices and beliefs related to the perception of the lifestyle
- Analyze the relationship between %BF and lipid profile with the eating habits
- Correlate the BMI, HWI, WC, the Sum of 6 folds and %BF with the beliefs and practices associated with the lifestyle perceived by amateur runners
- Correlate the lipid profile with the beliefs and practices associated with the lifestyle perceived by amateur runners.

It is intended to contribute to the knowledge of the situation of corridors in Autonomous City of Buenos Aires (ACAB) and to derive recommendations and strategies for a comprehensive and interdisciplinary approach to maintaining health, knowledge of risk factors and disease prevention.

## MATERIALS AND METHODS

An analytical, correlational, cross-sectional and quantitative study was carried out in the Autonomous City of Buenos Aires from 2016 to 2018. From the universe population, through an intentional or convenience sampling, a sample of 67 amateur runners of both sexes was worked on that belonged to Runner teams. The units of analysis were finally 46 runners who participated in street races. They were interviewed at the training place, day and schedule previously set with their group coordinator. The inclusion criteria for the individuals were: to participate in training groups for street runners in ACAB, over 18 years old, that have voluntarily agreed to participate in this research, and that all the instruments used in the investigation would respond and could be evaluated.

The exclusion criteria were for participants who: suffer from pathologies or with a medical contraindication to perform physical exercise, women who are pregnant, to refuse to be evaluated or voluntarily participate in the research or those who were elite athletes.

Finally, the elimination criteria were for participants who: will not carry out anthropometric measurements and / or will not deliver laboratory analysis with lipid profile or did not respond to the surveys provided.

Anthropometric evaluations and interviews, together with the signing of the informed consent, were carried out at the training site of each runner team. The type of research, its objectives, the method of delivery of the questionnaires and the characteristics specified in the informed consent regarding confidentiality, were explained in groups. Anthropometric measurements were individuals. Communication was maintained via e-mail. The results of their evaluations and the questionnaires that they had to answer and return by the same route were sent along with the laboratory studies regarding the lipid profile. Argentine reference tables were used both for anthropometric variables and for food and portion recommendations. The adaptations of the instruments were due to reasons of greater understanding, exclusion of questions or items that did not correspond to the objectives of this study or for cultural or idiomatic reasons that could confuse or bias the response of the interviewee.

**Anthropometric assessment:** the measurement technique used is that established by the International Society for the Advancement of Kinanthropometry (ISAK) [5]. The equipment for the measurements was a portable OMRON bioimpedance electronic balance and the portable Rosscraft SRL kit manufactured in Buenos Aires, Argentina.

Through these measurements, BMI, HWI, ∑6s and %BF (according to the Yuhasz equation) [6].

- For *BMI* it was used the categories of WHO, 1998: Normal: 18.5 to 24.9, • Low weight: <18.5, • Overweight: 25 to 29.9, • Obesity: > 30
- For the ∑6s and %BF it was used the classification according to ARGO-REF tables adapted by age range and sex:
- *∑6s:*
- Very low: less than 1SD to mean, • Low: -1SD to 3 mm to mean, • Close to mean: mean +/- 3mm
- High: from 3 mm to + 1SD to mean, • Very high: up to 1SD.
- *%FB:*
- Very low: less than 1SD to mean, • Low: from -1SD to 1% to mean, • Close to average: +/-1% to mean, • High: from 1% to +1 SD to mean, • Very high: + than 1SD.
- For *WC* it was used the NIH Classification (1998)
- Women: • Low risk of complications: ≤80 cm, • Increased risk of complications: 80.5 to 88 cm• Very increased risk of complications:> 88 cm
- Men:
- Low risk of complications: ≤94 cm, • Increased risk of complications: 94.5 to 102 cm, • Very increased risk of complications:> 102 cm.
- For *HIW*, according to WHO classification (1998)
- Women:
- Low cardiovascular risk: <0.8, • Medium cardiovascular risk: 0.8-0.84, • High cardiovascular risk: > 0.84
- Men
- Low cardiovascular risk: <0.95, • Medium car-

diovascular risk: 0.95-0.99, • High cardiovascular risk: > 0.99

For the evaluation of the **lipid profile,** the results of a laboratory study of peripheral blood extraction were requested to be sent via e-mail. A previous study of these characteristics was also taken as valid as long as it was not more than one year from the inclusion in the research. Since all the participants were members of runner teams in which the complete PHYSICAL FIT is requested, the most recent laboratory study was taken.

The lipid profile to be evaluated included the following values: Total Cholesterol, HDLc, LDLc and TG. The predictive indices of atherogenesis that were calculated were: TCOL / HDLc or Castelli's atherogenic index, LDLc / HDLc and TG / HDLc [7].

The recommendations of the third report of the National Cholesterol Education Program (NCEP) expert panel on the detection, evaluation, and treatment of high blood cholesterol in adults (ATP III - Adult Treatment Panel III 2004 update) were used as reference values. [8].

*LDL Cholesterol* (mg/dL)

<100 Optimal, 100-129 Near optimal/above optimal, 130-159 Borderline high,, 160-189 High, >190 Very high

*Total Cholesterol* (mg/dL)

<200 Desirable, 200-239 Borderline high, >240 High

*HDL Cholesterol* (mg/dL)

<40 Low, 40-60 Normal, >60 High

**Eating habits:** it was used the United States National Cancer Institute Food History Questionnaire (DHQ I, 2007) [9] adapted and with table format. For all food groups, the GAPA (Dietary Guidelines for the Argentine Population, Ministry of Health. Presidency of the Nation) consumption frequency recommendations were taken as references. According to these recommendations, the different food groups were analyzed by categories (adequate and inappropriate or enough and insufficient).

**Physical activity:** it was used the adapted GPAQ version 2.0 questionnaire (Global Physical Activity Questionnaire, 2006) [10]. To calculate the levels of total physical activity for each runner, it was considered: Vigorous work and recreation: Intense MET value = 8.0; Moderate work and recreation and travel: Moderate MET = 4; Seated.

**Lifestyle:** it was used an adaptation of the Questionnaire of Practices and Beliefs on Lifestyles [11] that assesses: condition, physical activity and sport; Leisure time; self-care and medical care; Eating Habits; consumption of alcohol, tobacco and other drugs; and I dream. Authorization was obtained from the authors for its use. The questionnaire has 83 items, but 64 items distributed in two subscales were intentionally selected: practices (59 items) and beliefs (5 items) according to their relevance to this study since the complete questionnaire contains instructions for Health personnel according to their work practice. The rating categories established for the lifestyle beliefs and practices questionnaire are as follows:

*Practices*: very healthy, healthy, unhealthy and unhealthy. They were established in terms of the frequency of the practices performed.

*Beliefs*: very high, high, low and very low. These categories were established according to the degree of presence of beliefs favorable or unfavorable to health. The responses to the section on Practices were assessed using a Likert scale, according to the following score:

1 = Never, 2 = Sometimes, 3 = Frequently, 4 = Always

If it was negative behavior:

1 = Always, 2 = Frequently, 3 = Sometimes, 4 = Never.

For the questions in the Beliefs section, they were also assessed through a Likert scale, according to the following score

1 = Strongly disagree, 2 and 3 = Disagree, 4 and 5 = Agree, 6 = Strongly agree.

If it's negative behavior:

6 = Strongly disagree, 5 and 4 = Disagree, 3 and 2 = Agree, 1 = Strongly agree.

Then the ranges of scores were considered for the rating of Practices and Beliefs.

In order to guarantee compliance with ethical principles, it was requested a verbal and written informed consent, using a model adapted from the WHO instrument (Committee for the Ethical Evaluation of Research, REC). A favorable opinion was obtained from the Ethics Committee for scientific and technological research of the Universidad Abierta Interamericana.

The Microsoft Excel program from the Office 365 package was used to load and process the data.

For the analysis of the data collected in the measurements, it was designed a data matrix that included all

the units of analysis coded numerically to guarantee anonymity and facilitate the tabulation of the variables with their respective values.

The data were treated statistically with the Statistical Package for the Social Sciences (SPSS) 25 version. Descriptive parametric statistics (arithmetic mean and standard deviation, minimum and maximum values) of each interval were performed. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were expressed as absolute and relative frequencies.

The non-parametric Mann-Whitney test was applied because it was an intentional non-randomized sample and the Kruskall Wallis test for non-normal distributions with three or more possibilities, to compare means in dichotomous variables, according to the tests of normality and homogeneity of variance and Pearson's correlation coefficient test for quantitative ones. $p < 0.05$ was considered significant.

## RESULTS

The age range was 25 to 66 years with a mean age of 44.2 ± 11.1 years. The Waist Circumference (WC) in both sexes was lower than the reference values and 84.7 % presented low values of cardiometabolic risk. 81.7% of the men were overweight. If the cases of overweight and obesity are added, 28.2% of the total sample is reached, of which 54% had a high %BF. The general value of the sum of 6 folds was 77.4 ± 23.9 mm. 67% presented a value between low and very low as well as a low value of %,BF which expresses a reduced level of subcutaneous fat which is commonly present in long distance runner profile and also a desirable level of total cholesterol. (Fig. 1)

ANTHROPOMETRIC VALUES OF AMATEUR STREET RUNNERS OF ACAB DURING 2016-2018. FIG. 1

| Anthropometric values | mean | SD |
|---|---|---|
| Weight (Kg) | 68,1 | 11,3 |
| Height (cm) | 160 | 9 |
| BMI (kg/m2) | 23,6 | 3 |
| WC (cm) | 80,1 | 9,29 |
| HC (cm) | 97,8 | 5,7 |
| Waist to hip ratio | 0,8 | 0,07 |
| Tricipital fold (cm) | 11,6 | 4,6 |
| Subscapular fold (cm) | 10,3 | 3,4 |
| Supraspinal fold (cm) | 12,6 | 5,7 |
| Abdominal fold (cm) | 19,5 | 7,1 |
| Front Thigh Fold (cm) | 15,4 | 6,6 |
| Calf crease (cm) | 7,8 | 5 |
| ∑6s (cm) | 77,4 | 23,9 |

Of those surveyed, 67% (n = 31) had total cholesterol levels at a desirable level, 48% (n = 22) had values corresponding to a high level of HDLc, and 76% (n = 35) had values within normal or desirable ranges, corresponding to the risk labels close to the optimal and optimal LDLc. 96% (n = 44) had normal TG values as well as values within the desirable of the index between TG and cHDL and the Castelli index, while 24% (n = 9) presented a risky level of the relationship between cLDL and cHDL. (Fig. 2)

LIPID PROFILE IN BLOOD OF AMATEUR STREET RUNNERS OF ACAB DURING 2016-2018. FIG. 2

| Lipid parameter | mean | SD |
|---|---|---|
| Total Cholesterol (mg/dL) | 190,8 | 32,1 |
| cHDL(mg/dL) | 61,7 | 16,1 |
| cLDL(mg/dL) | 118,2 | 25,2 |
| TG(mg/dL) | 83,8 | 32,4 |
| Castelli Index* | 3,2 | 0,9 |
| cLDL/cHDL | 94,3 | 2 |
| TG/cHDL | 1,54 | 1 |

Most of the runners reached the consumption recommendations for the different food groups, quantitatively and qualitatively. However, 48% (n = 22) did not get the consumption recommendation of the meat and egg group and a third did not reach the suggested consumption of the group legumes, cereals, potatoes, bread and pasta, when these foods are a source of energy necessary for aerobic activities. 54% (n = 25) exceeded the recommendation for consumption of sweets and fats - optional consumption foods; 33% (n = 15) did not comply with the recommended water consumption, 39% (n = 18) reported consuming dietary supplements, mostly men. Differentiating by sex, women had more adequate intakes than men of milk, yogurt and cheese, and of vegetables and fruits. More men than women met the recommendation for healthy snack intake. (Fig. 3).

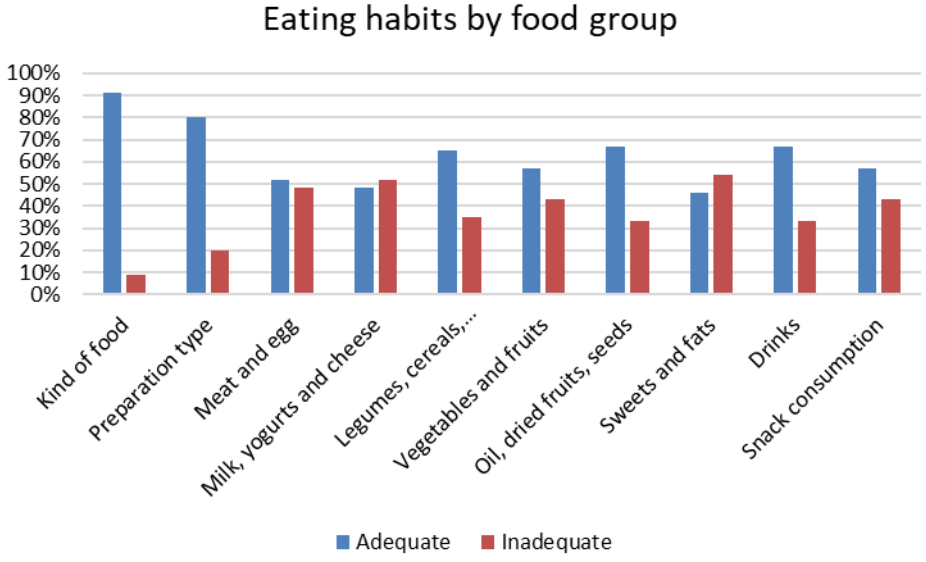


FIG. 3

When analyzing the Lifestyle of the sample, the results indicate that all report a Very Healthy (15%, n = 7) or Healthy (85%, n = 39) level.

When performing the correlations between the scores obtained in lifestyles with the anthropometric data and the raw data of the lipid profile, statistically significant correlations were found: as BMI increases, the lifestyle score decreases, that is, lower scores in the lifestyle are related to an increase in body weight ($p < 0.000$, correlation coefficient: -0.326). The same occurs in women, in whom this correlation is statistically significant and negative or inversely proportional ($p = 0.000$, correlation coefficient: -0.261). High-density cholesterol (cHDL) increases as the lifestyle score increases, both for men (correlation coefficient

0.004, p = 0.000) and for women (correlation coefficient 0.033, p = 0.000), since it is a statistically significant and positive correlation.
In men, a media and inverse correlation with lifestyle stands out, which is ∑ 6 p, with a correlation coefficient of -0.543 (p = 0.000).

## DISCUSSION

This work was proposed as a general objective to analyze the relationship between the perception that amateur runners of both sexes express about their lifestyle and eating decisions and the objective and measurable values of body composition and lipid profile.
Regarding BMI, values were higher than the Cinfasalud study [12] and similar to that of De Oliveira et al. [16]. However, of that percentage of overweight runners, half had low %BF levels. The BF and sum of 6 folds values in women were lower than the national ARGOREF references. It is to be expected because it is an aerobic and resistance activity in which the oxidative metabolism of fats intervenes as a prolonged source of energy. However, the sum of 6 folds in men was higher than the reference population. It was noticeable that a third of the sample had a summation value of 6 folds at a high or very high level and also among women, although in a low percentage, a high level of cardiometabolic risk was observed according to WHI and even among them there was an assessment of BMI at the level of obesity, which warrants an effective intervention from training and nutritional advice as well as focusing on an interdisciplinary work the prevention of injuries associated with overweight and cardiovascular complications. In these cases, it might be necessary to analyze how long it has been since they joined the *runner team* and if they had any specific and individualized training modality. Regarding eating habits, some similar results were found in the adequate consumption of fruits and vegetables, taking as reference the GAPA (400 g of vegetables and 300 g of fruit) of the study by De Oliveira et al. [16] with runners from Rio de Janeiro. According to the ENFR (Fourth National Survey of Risk Factors) [20] only 2% of the Argentine population complies with the recommendation. The results obtained by De Oliveira et al. are also similar. [16] regarding the adequacy in the consumption of the cereal group (76% vs. 65% in the present), despite the fact that they used the nutritional pyramid adapted to the sports population as a reference [21], with only a difference of + 30 g of cereal with respect to GAPA. This data is relevant given the long-term need for energy in this endurance activity and with aerobic metabolism. If the results are analyzed in comparison with the PAHO / WHO report [3] on consumption in Latin America, they coincide in high levels of saturated fats, sugars, sodium and processed products such as sugary drinks, high calorie snacks and fast foods. The inadequate intake of beverages implies health risks due to dehydration, especially in endurance athletes exposed to a higher rate of sweating and contradicts the recommendations set forth in the Consensus on sports beverages [22].
Given this, it could be estimated that the consumption of sugary drinks contributes to the increase in adipose tissue. In this study, 39% of the sample resorted to aids and supplements as a complement to sports training, a similar result to that obtained in the study of Spanish runners in which 37.4% had the same behavior [12] while others report higher percentages like Jahnke [23]. It is likely that there is some ignorance about its use and need, due to a possible lack of specialized nutritional advice that provides timely guidance. The type of supplements chosen by those who claimed to consume them corresponded to those usually recommended for this type of physical activity (gels, isotonic drinks and energy bars). In the study by Tokudome et al. On anthropometric and lifestyle assessment in non-professional runners in Japan, the same conclusion was reached: Japanese non-professional marathon runners with vigorous exercise habits demonstrated favorable health status according to the Biological indices: however, men had better TG and cHDL values, contrary to what is reflected in this study [24]. In the study by Jiménez et al. Those who regularly performed physical exercise perceived themselves to be healthier, with less stress, and had a better mood than those who did not perform any type of physical exercise [25]. In the case study of Fabra Heredia and Casadó, another assessment scale was used, but it also emerged that the case had adequate health care derived from managing their lifestyle, developing a pattern of healthy habits such as eating, regular physical exercise and staying away from harmful stimuli such as drugs or tobacco [26]. On the other hand, in the Jürgens study, the percep-

tion of quality of life among sedentary, recreational and competitive subjects was compared with the WHOQOL-100 (WHO) instrument and it turned out that the athletes obtained an average perception of quality of life overall higher than sedentary subjects, and higher as the level of training intensity increased [27]. When analyzing the instrument Questionnaire on Lifestyle Practices and Beliefs, the level reached by the domain corresponding to eating habits is Healthy, in accordance with that valued by the DHQ I in which the general consumption was adequate. In other words, what they perceive seems to correspond to what they consume, although it cannot be statistically demonstrated. The predominantly Healthy or Very Healthy lifestyle involves a subjective perception of your lifestyle practices and beliefs that affects your overall state of well-being and reinforces the beneficial effects of regular physical activity. This is inserted as a Healthy habit chosen together with others. Most of the runners considered among their beliefs that health is "individual responsibility of each person", which manifests a perception of responsibility and commitment to self-manage their physical and mental well-being, and it is crucial to take advantage of and optimize this visualization as an initial motivation to improve and sustain a favorable lifestyle.

According to the observed results, it is possible to affirm that the timely and objective measurement of the anthropometric indicators and the lipid profile studied, contributes to the prevention of cardiometabolic risk and could have a favorable impact on the health of those runners who perceive and claim to have a healthier life.

A limitation of this study was the small size of the sample, influenced by the losses that occurred or the individuals who had to be eliminated, in addition to the absence of a government or institutional registry or list that would allow access to more corridors more easily. The contact with the runner teams was personal and dedicated but although the initial interest of the runners was evident, perhaps they did not want to invest more time in answering surveys or questionnaires and not all of them sent the complete information required. This leads to the impossibility of making inferences for the general population of street runners, and is also a consequence of the difficulty of using a probability sampling plan. The results obtained must be considered with the usual precautions in studies carried out with induced samples. However, it should be emphasized that they allow targeting a population of which little is known and there are no national references on its characteristics. Despite this, the results are comparable to those reported in the literature. More research is needed in this field by making measurements in larger samples, in order to achieve a broader description of the anthropometric characteristics, lipid profile, consumption habits and lifestyle, and establish comparisons between different regions. Regarding the instruments used, a highly variable adherence of participants to the modality was achieved, an overestimation of favorable characteristics and an underestimation of unfavorable ones, inadequate quantification of the portions of food consumed, etc. In general, it is possible that some individuals responded according to their perception of a socially desirable response. Given the decision to use scientifically validated questionnaires to minimize the occurrence of errors, no instrument of our own elaboration was created. In retrospect, this limited the possibility of knowing other variables that would make this study more accurate, such as if you are currently under a prescribed eating plan, how long has elapsed since the beginning of the training as a street runner, if you carry out complementary medical studies, what are your motivations for doing physical activity, what is the number of competitions in which you participate per year, if you do combined competitions, if you receive nutritional advice, amongst others.

No national reference studies were found with which to establish a discussion once the results were obtained, and this made it necessary to collate different studies for each variable evaluated in most cases and / or foreign ones. This represents an opportunity to identify national information gaps on scarce and limited data that address the relationship between anthropometric variables and lipid profile with eating habits and lifestyle in amateur runners and lay the foundations for future research. The results of this study allow supporting the favorable impact on health that incorporating physical activity into the usual routine has from the different dimensions of the lifestyle and the choice of appropriate eating habits, as well as the benefit that this causes on the body composition and lipid profile.

## CONFLICTS OF INTERES

*The authors declare not to have any interest conflicts.*

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