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How distances to Urban Green Spaces and Open Sport Spaces can influence physical activity in teenagers of Porto Community. The EPIteen (Epidemiological Health Investigation of Teenagers in Porto) Cohort

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To my Parents

To my daughter

To Manuela

To Professor Maria de Fátima Pina

To Professor Elisabete Ramos

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Resumo

Há um reconhecimento crescente de que Espaços Verdes Urbanos (EVU) e Espaços Desportivos Abertos (EDA) podem aumentar os níveis de actividade física, não sendo ainda reconhecido na sua plenitude o enorme potencial destes espaços. Alguns estudos mostram que a proximidade a estes espaços públicos, de fácil acesso, pode promover o desenvolvimento da prática de actividade física.

Neste trabalho, desenvolvido no âmbito da coorte do EPITeen, objectivou-se examinar a associação entre as distâncias das residências de adolescentes de 17 anos da cidade do Porto aos EVU/EDA e a prática de actividade física e desportiva auto-relatada.

Analisou-se uma amostra de 1489 (51.4% raparigas) adolescentes que viviam na cidade do Porto. Os dados sobre a actividade física e a actividade desportiva foram obtidos e avaliados através de um inquérito estruturado. Os participantes foram georeferenciados a partir das moradas das suas residências, os limites dos EVU foram obtidas através de mapas digitais da Câmara Municipal do Porto e de imagens de satélite do Google Earth e os EDA foram georeferenciados através do uso de Sistemas de Posicionamento Global (GPS).

Foram criados *buffers* de 250 metros e 500 metros em torno dos EVU/ EDA e em seguida intersectados com os locais de residência dos participantes, criando-se três classes de distâncias, classe 1: ≤ 250m; classe 2: > 250m a ≤ 500m e classe 3: > 500m.

Testes de Qui-quadrado ($p<0.05$) foram utilizados para avaliar as proporções entre a Intensidade de Actividade Física (IAF), Actividade Desportiva (AD) e Volume de Actividade Desportiva Ofegante (VADO) com as classes de distância aos EVU/EDA, Escolaridade dos pais, Obesidade, Asma e Rinite, e Condição Socioeconómica da zona de residência. A análise de Regressão Logística foi utilizada para investigar a associação entre a distância dos EVU/EDA com a IAF (ajustado para o IMC e Educação dos Pais em ambos os

sexos) e a AD (ajustado para a educação dos pais em ambos os sexos e IMC nos rapazes).

A prática desportiva foi referida por 37.9% das raparigas e 72% dos rapazes (p<0.001). Usando como classe de referência d_classe1, foram obtidos os seguintes OR ajustados (IC95%): na prática de AD, em relação à proximidade aos EVU, para raparigas e rapazes foram: OR = 0.84 (0.59; 1.21) para a classe 2, OR = 0.70 (0.45; 1.07) para a classe 3 e OR= 0.90 (0.60; 1.35) para classe 2 ,OR= 0.85 (0.55; 1.31) para classe 3, respectivamente.

Em relação à proximidade aos EDA: OR = 0.95 (0.62; 1.45) para classe 2 e um OR = 1.34 (0.88; 2.05) para a classe 3 nas raparigas e OR=1.25 (0.78; 2.01) para classe2 e OR=1.12 (0.71; 1.76) para classe3 entre os rapazes.

A Intensidade de Actividade Física, em relação à proximidade dos EVU apresentou os seguintes resultados: entre as raparigas OR= 0.99 (0.70; 1.42) para classe2 e OR= 0.81 (0.54; 1.24) para classe3 e entre os rapazes OR= 0.85 (0.58; 1.24) e OR= 0.69 (0.46; 1.03) para classe2 e classe3 respectivamente. Com relação à proximidade aos EDA os resultados foram: entre as meninas, OR= 0.75 (0.50; 1.13) para classe2 e OR= 1.14 (0.76; 1.71) para classe3 e entre os rapazes OR= 1.30 (0.84; 2.01) e 1.38 (0.90; 2.11) respectivamente para a classe 2 e classe3.

Os resultados indicam que, para ambos os sexos, viver mais perto dos EVU está associado com maior prática de AD e maior IAF e viver mais próximo dos EDA não foi determinante para a prática de AD e a IAF.

Palavras Chave: Saúde, Espaços Verdes Urbanos, Espaços Desportivos Abertos, Meio-ambiente, Actividade Física, Actividade Desportiva, Sistema de Informação Geográfica.

Abstract

There is a growing recognition that Urban Green Spaces (UGS) and Open Sport Spaces (OSS) can increase levels of physical activity (PA), but the enormous potential of these spaces is still not fully recognized. Some studies and evidences show that proximity to public OSS and UGS in the neighborhood can promote the development of the physical activity.

In this research, developed as part of the EPITeen cohort, it was aimed to examine the association between distances from residences of 17-year-old adolescents of Porto municipality to UGS/OSS and the practice of PA and Sports activity (SA) Self-related.

A sample of 1489 (51.4% girls) adolescents living in Porto city was analyzed. Sports and PA were assessed using a self-reported questionnaire. Participants were georeferenced by residences addresses the limits of UGS were obtained from digital maps of the Municipality of Porto and satellite images of Google Earth, the OSS were georefenced by using Global Positioning Systems (GPS). Buffers of 250m and 500m were created around UGS/OSS in digital maps and intersected with teenagers' residences and three classes of distances were created, class 1: ≤ 250m; class 2: > 250m a ≤ 500m and class 3: > 500m. Qui-square ($p<0.05$) tests were used to evaluate the proportions between Intensity of Physical Activity (IPA), Sport Activity (SA) and Volume of Breathless Sports Activity (VBSA) with distances to UGS/OSS, Schooling parents, Obesity, Asthma, Rhinitis, Socioeconomic Conditions of the Place of Residence. Logistic regression analysis was used to investigate the association between distance to UGS/OSS with intensity of PA (IPA) (adjusted to BMI and Parents' education in both sexes) and SA (adjusted to parents' education in both sexes and BMI only in boys). The sport was reported by 37.9% of girls and 72% of boys ($p <0.001$). Using as reference class, class 1, were obtained the following adjusted ORs (95%) in the practice of SA in relation to proximity to UGS for girls and boys were: OR = 0.84 (0.59; 1.21) for class 2, OR = 0.70 (0.45; 1.07) for class 3 and OR= 0.90 (0.60; 1.35) for class 2, OR= 0.85 (0.55; 1.31) for class 3, respectively. In relation to proximity to OSS: OR = 0.95 (0.62; 1.45) for class 2

and an OR = 1.34 (0.88; 2.05) for class 3 in girls and OR=1.25 (0.78; 2.01) for class 2 and OR=1.12 (0.71; 1.76) for class 3 in boys.

On Intensity of Physical Activity, in relation to proximity of UGS showed the following results: between girls OR= 0.99 (0.70; 1.42) for class 2 and OR= 0.81 (0.54; 1.24) for class 3 and in boys OR= 0.85 (0.58; 1.24) and OR= 0.69 (0.46; 1.03) for class 2 and class 3 respectively. In relation to OSS proximity, the results were: in girls, OR= 0.75 (0.50; 1.13) for class 2 and OR= 1.14 (0.76; 1.71) for class 3 and in boys OR= 1.30 (0.84; 2.01) e 1.38 (0.90; 2.11) respectively for class 2 and class 3.

Results showed for both sexes, that living closer to the UGS is associated with more SA and higher level of IPA and living closer to OSS was not determinant to SA and IPA

Key Words: Health; Urban Green Sports; Open Sport Spaces; Environmental; Physical Activity; Sport Activity; Geographic Information System.

Abbreviations List

BMI- Body Mass Index

BSA- Breathless Sport Activity

CDC- Center for Diseases and Control

EU- Europe

GIS- Geographic Information System

GPS- Global Position System

IPA- Intensity of Physical Activity

LCA- Location Coefficient Assigned

NHS- National Health System

OSS- Open Sport Spaces

PA- Physical Activity

SA- Sport Activity

SCPR- Socioeconomic Condition of the Place of Residence

WHO- World Health Organization

UGS- Urban Green Spaces

VBSA- Volume of Breathless Sport Activity

Chapter 1: Introduction

1- INTRODUCTION

This research project was developed in the context of the Master degree in Public Health, from Faculdade de Medicina and Instituto de Ciências Biomédicas Abel Salazar of Porto University and has the title: **How distances to Urban Green Spaces and Open Sport Spaces can influence physical activity in teenagers of Porto Community. The EPIteen (**Epidemiological Health Investigation of Teenagers in Porto **) Cohort**.

Research about the impact of the physical environmental on health and well-being is a relatively new area, particularly in the promotion of physical activity (PA). The designed environment is gaining prominence as an important factor in human health behavior. The effect of the designed environment on the influence of physical activity is now a major interest to public health policy makers and health providers [1, 2]. According to the Centers of Disease Control and Prevention - CDC (1999) and the World Health Organization - WHO (2000), increasing the level of physical activity helps to improve health and well-being and preserving the quality of life among teenagers [3, 4].

The potential health risks associated with an inactive lifestyle have created a growing demand for active living communities. Few studies stated that some urban characteristics, are associated with a tendency to sedentary lifestyles, mainly because the urban environment is not designed to encourage walking or physical exercise [5]. Both existent and perceived aesthetic and functional features of the environment can impact the participation in physical activities [6]; therefore, people's perceptions about the environment have important implications for understanding and developing guidelines that can help to achieve physically active lifestyles. Environment act as a powerful force on people's health and well-being. Physical features of the designed environment can influence a variety of health outcomes and can also improve known health indicators, for example, stress, anxiety, depression, social isolation, sensory

deprivation and sedentary behavior. Researches have shown that all types of physical activity reduces depression anxiety and stress, increases self-esteem, contributes to improved cognitive function, enhances self efficacy and psychological well-being and it is positively associated with increased social support [7-9]. So, there are evidences to suggest that the contact with nature lead to many mental and physical health benefits, as well as a range of social benefits that interact to affect health outcomes.

Researchers from several areas, including urban planning, architecture, public health, parks and recreation, transportation, and others provide convergent evidence that community designed urban characteristics are associated with PA. People with better access to either walking paths or exercise equipments are more likely to use those resources [10]. Other factors found to be significantly associated with PA are enjoyable scenery or neighborhood aesthetics [11-13], convenience of facilities [13] and the presence of green spaces for walking [14]. Access to appropriate facilities or settings is important to PA [12, 15] and has been linked to leisure time PA [10]. It is possible to maintain and improve quality of life of the population, including teenagers, by designing opportunities for active living into everyday environments where regular PA is an accepted part of daily life. Previous studies suggest that regular moderate PA as cycling, walking, jogging, swimming, riding horse, contributes significantly to the psychological and physiological health of the individual [9]. Recommendations are that adults should participate in 30 minutes of moderate PA on at least five days per week and that all school-children should participate in PA at least of moderate intensity for one hour per day that can be divided into smaller bouts of 10 minutes [16-18]. These recommendations are goals toward which people must strive. Problems related with Health and Inactivity is a major preoccupation nowadays. Sedentary life style and physical inactivity are associated with obesity, chronically diseases, arterial hypertension, cardio vascular diseases and mental health diseases [19].

Some studies and evidences show that access to public Open Sports Spaces (OSS) and Urban Green Spaces (UGS) in the neighborhood can drive to the improve in the PA, due to easily and directly access to those places [19, 20].

Mostly of the studies are related to the adult and elderly population, although little is known about the influence of the neighborhood or community context in the teenagers participation in more common physical activities such as walking, cycling, jogging and swimming [21] and some international studies presented different conclusions. Therefore it is of relevance to develop studies in order to determine if the physical environment is determinant to the practice of PA among teenagers.

Regular moderate intensity PA may help to delay the onset of diseases and disability and prevent maintaining health and functional independence. It is important to note that the delay in the appearance of a disease can dramatically reduce disability and the cost of medical care, therefore it's important that the design of the physical environment respond to the changing PA profiles and preferences of the teenagers to increase PA and help to reduce disease and disability in the present and in the future.

The number and variety of PA opportunities for teenagers is very important but, despite the environmental features it is also important to identify the PA in which schools are engaged [22]. This Information would be helpful not only to the design and community planning disciplines but also to health care services providers, so increasing PA among teenagers is an important step toward improving preventive health practices that will potentially reduce the needs in the elderly for more quantity and expensive levels of care [23].

In this study we aim to identify the association between Urban Green Spaces (UGS) and Open Sport Spaces (OSS) and the physical activity behavior in 17-older teenagers of Porto city.

This dissertation is composed by four chapters. The first chapter consists of the general introduction while second chapter is composed by definitions of PA. Chapter 3 is composed of a small literature review while chapter 4 is composed

by an original article to be submitted in a scientific journal. After all chapters are presented the References used in this dissertation and the Annexes more specifically the tables and the photos about our environment too.

Chapter 2: Definition of Concepts

2- DEFINITION OF CONCEPTS: Physical Activity and, Sport Activity

The physical or sport activity is a major factor in the development of any human being, whether social, psychological or physical. It improves physical fitness and cardio-respiratory capacities, muscular strength, flexibility and body composition [24], reducing the risk factors and being a strong promoter of health among children and adolescents as well as in adults and in the elderly.[23].

Physical activity (PA) is defined as any "*bodily movement produced by the contraction of skeletal muscles that substantially increases energy expenditure, although the intensity and the duration can vary*".

Exercise is *"a subcategory of leisure time physical activity in which planned, structured, repetitive bodily movements are performed"*.

Physical fitness is a *"set of the attributes that people have or achieve that relates to the ability to perform physical activity"*[25].

Although with different meanings the terms PA and exercise are often used interchangeably. Nevertheless, PA refers to any movement of the body that result in a spent of energy and burning of calories while exercise can be seen as the PA performed in leisure time and physical fitness is the outcome that can be attained through exercising at the frequency, intensity and length of time proscribe by the American College of Sports Medicine(ACSM) (1995) [26-28].

Activity is a broad term that encompasses PA like walking, jogging, running, playing soccer, swimming, riding horse and other activities. Reading, watching television, playing video games which are not considered PA. The general term "activities" also include lifestyle activities, like climbing stairs or brisk walking or structured exercise or sport or a combination of these [18]. Exercise or PA can be characterized in terms of three elements: Intensity, Duration and Frequency [8]. Intensity of the exercise is related to the level at which a body person is working, as a percentage of an individual's maximal heart rate. Duration refers to the time of the period that the activity is performed and Frequency means the number of exercise sessions a person participates in the activity weekly.

Moderate exercise includes walking, cycling, swimming, gardening, horse riding and conservation work (if possible in the context of a wildlife-rich environment). This level of activity is enough to raise the pulse to over 60% of the maximum heart rate [29], which is the thresh old to improve cardiovascular health.
Moderate physical activities have several advantages over vigorous activities, are considered as routine exercise and therefore, require less physical effort and no special equipment or specific schedule.

Sport is defined as a subset of physical activity that involves structured competitive situations governed by rules. However in mainland Europe sport is often used in a wider context to include all exercise and leisure PA [30].

Volume of PA is the total amount of PA performed over a fixed period. It is a combination of the frequency, time and intensity of all activity bouts during that period [30].

Chapter 3: State of Art

3- STATE OF ART

3.1- Physical Activity and Health

Under the basic law [31] for the Physical activity and Sport, more specifically on the principle of universality and equality, everyone has the right to physical and sporting activity, regardless of their ancestry, sex, race, ethnicity, language, place of origin, religion, political or ideological beliefs, education, economic situation or social circumstances and also the sexual. Physical activity and sport should contribute to the promotion of a situation balanced and non-discriminatory between man and women [31].

The physical or sport activity is essential to human development, both in the social and psychological as the physical. Improves physical fitness and cardio-respiratory, muscular strength, flexibility and body composition. [32], as well as reduce the risk factors in children and adolescents and adults, making us believe that physical activity is a health promoter. Health is therefore seen as a resource for daily life, not her aim; cover social and personal resources as well as physical capacities, is a positive concept [33]
Although a big part of the population knows the benefits of PA and SA, many adults, childrens and teenagers aren't actives enough to improve their health [10]. Activities as walking, running and cycling are PA with a moderate intensity, besides being simple realization characterizes the individual as an active being. This kind of activities is beneficial for human health regardless of its purpose [34]. For better benefits the PA and SA should start in childhood and adolescence, researches showed that is in this phase that win lasting habits of physical activity that remain in adulthood [35]. Kids are changing their daily styles of life, by abandoning physical activities in favor of other entertainments as TV, Chatting in net and Video games [36]. Some studies show that the levels of physical activity will be lost as the children will advance to teenagers [37] and that boys are more physical active than girls [36]. In childhood levels of PA remain stable and will suffer a decline at older ages, more precisely in teen ages as a Dutch research that compares children with teenagers in both sexes showed [25]. Being organized PA, defined as activities with some kind of

supervision and ordered to participate with rules, whether in physical activities not organized, without any supervision and participation of spontaneous character, the boys showed more participation than girls [38]. These results confirm that it is the younger and boys are the more physically active [39]. Researchers in the area allow that kids should practice at least one hour of PA per day, five days or more per week with moderate intensity [40]. However studies showed that teenagers do not follow the recommendations to the ideal levels of PA [24].

The Portuguese adolescents are considered among the young Europeans who have lower levels of PA and with a high prevalence of overweight and obesity, as a few researches showed [41]. Prevention of obesity and the reduction of excess of weight, necessarily involves two possibilities: to increase energy expenditure and reduce consumption. The earlier the appropriate habits of food consumption and physical activity are implemented in the development of individuals the greater will be the chance to reduce the prevalence of obesity in teenagers and in adults. The classification of obesity in adolescents is not consensual, being the sexual maturation one of the main concerns. Several authors believe that the classification of overweight or obesity should take into account the stage of sexual maturation, which is associated with profound changes in anthropometric and body fat accumulation. A recent study made at Rio de Janeiro city, with adolescents from a slum, revealed that sexual maturation in this population of low socioeconomic condition, were far more associated with BMI (Body Mass Index) than the age [42].

Another study in Chile, proposed a classification that takes into account the development of puberty in adolescents. The authors showed that the BMI increased significantly with each stage of development at puberty. The proposed classification uses the 90th percentile of BMI at each stage of maturation, as the cut-off point [43]

3.2- Demographic Factors

Age and Sex are important indicators of social papers in teenagers and PA is an example of this, as a few studies showed, where younger boys are more PA [25] and boys are more PA and SA than girls [44]. Other study showed that in Portuguese teenagers, boys are more PA than girls being in the age group of 12 to 14 years or in the group of 15 to 18 years, whether in organized PA or in not organized PA.

In respect to the age, is from the 14 years that begin to notice a decline of PA observing a sharp decline in the practice of sports after this age [45] having researchers defending that the greatest decline is around 17 years old, when a large proportion of adolescents enter in college [46].

Social and economic factors are related to the practice of physical activity and sport. The social and family environments are strongly linked with the healthy lifestyle habits and automatically with the practice of physical activity and family is one of the main factors which can influence the adolescents' behaviors. More socioeconomically advantaged people the more participation in leisure time activities, as walking for example, than those less advantaged, something similar is observed in the participation in sports activities [30].

An European study showed that parents have an important role in adhesion and maintenance of sport activities in children, either by their healthy lifestyle as by the sport chosen and facilitated transport [47]. In both men and women and in all age groups, lower educational attainment predicts higher levels of inactivity [30], there is a strong link between education and the amount of sport that people play, higher levels of education are linked with better standards of living. The data in this study suggests that, more highly educated EU citizens, better physical fitness and better quality of life they have [47].

Other studies identified a relationship between socioeconomic factors and potential mediators of health behaviors as physical activity, diet and sedentary behavior and showed that socioeconomic inequality is associated with healthy behaviors [48]. So it seems that the socioeconomic status of parents increases

the participation of children in sports, facilitates the access to places with equipments and participation in sports club [47]. A systematic review suggested that to increase the physical activity in children the whole family should be target, and parents can strongly influence physical activity behaviors through role-modeling and direct involvement and these influence may continue through adolescence [46], while other studies indicate that the influence of family is being replaced by the influence of peers, becoming more evident in adolescence [47].

3.3 –**Environment- Urban Green Spaces and Open Sports Spaces**

The concept of environmental resources suggests that a physical object or setting is enabling to be used in a particular way because of the characteristics of its configuration. The physical configuration allows a behavior to occur if the person using the setting recognizes its resources and decide to use them. Personal needs are capable of being satisfied as a function of the ability of the environment to reach those needs. The person must actively chose to use the environment, a set of personal needs and the environment resources should result in a behavioral outcomes as physical activity, social relations and subjective states that may be evaluated in terms of quality of life in the teenagers [31]. A better understanding of the relationship between exercise and healthy rich life in open space will help the Governments reach targets to increase levels of PA, as well as provide a significant economic reason to maintain UGS and OSS. A few researchers showed that the results and evidences about the links between the environment and physical activity is still limited and in need of conceptual and methodological development [49, 50]. While other researchers showed that also the size, attractiveness and appropriateness of the leisure spaces are likely to be important on the use of it, not only for being closer [51], and personal perceptions of safety and many other factors may modify the effect of physical parameters [1, 52].

Perceptions about elements in the environment are strongly influenced by cognitive resources. For example, the existence of access to UGS/OSS or a

well maintained walking circuit versus a poorly maintained: both offer the opportunity to engage in physical activity, however, a poorly maintained may be perceived as a hazard and automatically may be less used [10]. For increasing PA levels in UGS and OSS, space should be accessible, with well kept access routes and facilities, where people can should feel safe, it must appear attractive; being natural because nature is a main motivator and have a good surface with no obstructions such as stiles, as a few studies conclude [53]. Therefore, investigation of the characteristics of specific PA behavior is essential to the understanding of the impact of environment on the PA behavior of teenagers [35, 40]. Levels of PA are increased by teenagers and children when they are outdoors and when they feel attracted to nature and sports spaces well organized [54].

Chapter 4: Scientific Article

4- SCIENTIFIC ARTICLE

How distances to Urban Green Spaces and Open Sport Spaces can influence physical activity in teenagers of Porto Community

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Abstract

Introduction: There is a growing recognition that urban green spaces (UGS) and open sport spaces (OSS) can increase levels of physical activity (PA), but the enormous potential of these spaces is still not fully recognized. **Objective:** We aimed to examine the association between distances from residences to UGS/OSS and the practice of PA and Sports activity (SA) in 17-year-old adolescents of Porto municipality. **Methods**: This study has been developed as part of the EPITeen cohort. We analyzed 1489 (51.4% girls) adolescents living in the city of Porto. Sports and PA were assessed using a self-reported questionnaire. Participants were georeferenced by home addresses. Geographical Information System (GIS) was used to create buffers of 250m and 500m around the limits of UGS/OSS and intersected it with the teenagers' residences localization. Logistic regression analysis was used to investigate the association between distance to UGS/OSS with intensity of PA (IPA) (adjusted to BMI, and Parents' education) and SA (adjusted to parents' education in boys and girls and obesity only in boys).

Results: Practice of sports was reported by 37.9% of the girls and by 72% of the boys (p<0,001). From those who reported sports practice 38.5% of the girls and

62.9% of the boys had high PA levels. Using distances ≤250m (class 1) as the reference class, the OR (CI95%) between practice of sports and UGS, among girls, were 0.84 (0.59; 1.21) for distances >250m and ≤500m (class 2) and 0.70 (0.45; 1.07) for distances >500m (class 3). Among boys, the results were 0.90 (0.60; 1.35) and 0.85 (0.55; 1.31), respectively for classes 2 and 3. Regarding the association between IPA and UGS, among girls, the OR were 0.99 (0.70; 1.42) for class 2, and 0.81 (0.54; 1.24) for class 3 while among boys the OR were 0.85 (0.58; 1.24) and 0.69 (0.46; 1.03) for classes 2 and 3 respectively. For the same classes of distances, among girls the association between practice of sports and proximity to OSS, were 0.95 (0.62; 1.45) and 1.34 (0.88; 2.05) for classes 2 and 3 respectively; among boys 1.25 (0.78; 2.01) and 1.12 (0.71; 1.76) for classes 2 and 3 respectively. Among girls, when association between IPA and OSS was analyzed, the OR were 0.75 (0.50; 1.13) and 1.14 (0.76; 1.71) respectively for classes 2 and 3 and among boys 1.30 (0.84; 2.01) for class 2 and 1.38 (0.90; 2.11) for class 3.

Conclusion: Adolescents closer to UGS and those most far from OSS were more physically active (higher IPA and more SA), although no statistically significant association was reached.

Introduction

The World Health Organization (WHO) recognizes that physical inactivity is a catastrophic burden to societies, and can lead to the increase of chronic diseases and lack of independence in the elderly [1]. The benefits of physical activity (PA) can be achieved through moderate and vigorous exercise, that can be identified by an increase in pulse and breathing rate and a feeling in a raising sensation of body temperature [2, 3], which includes fast walking, cycling, swimming, jogging, running and other sports in outdoor spaces. Practice moderate/vigorous PA is associated with better vitality of the body, and less risk of a large set of chronic diseases such as cardiovascular diseases, diabetes, cancers, disability, osteoporosis, depression, anxiety and sleeping problems [3-6]. For young teenagers, being physical active is also associated with a low risk of several chronic diseases and additionally increases the probability of being physical active in adulthood. So, several countries in the world defined promotion of PA as their priorities in the health and direct population to grow their own skills of PA as an investment to a future healthy generation [7].

There are some results showing that access to urban green spaces (UGS) and to public open sports spaces (OSS) in the neighborhood can drive to the increase in the practice of PA, by allowing an easier and directly opportunity to do PA [8-10]. Several studies have shown an association between proximity to UGS/OSS and the development of PA and sports activity (SA). Although the enormous potential of these spaces is still not fully recognized [2, 11-13], several factors can interfere with their use, such as size and attractiveness [14], proximity, accessibility and safety [15].

The aim of this study was to analyze the association between the distances to UGS/OSS and PA and SA of 17-years old teenager of Porto municipality.

Methodology

Study area and definition of UGS/OSS

The study area is the municipality of Porto, which has 41,66km^2 and, in 2001, had 263161 habitants [16, 17]. The UGS selected were areas of land where

plant species are present in an urban context as parks and gardens, above 2000m^2. The OSS were all public or private facilities for sports practice, free of charge and access without the need of formal inscription. The city of Porto has some large green areas, the largest being the City Park [18], encouraging encounters between citizens, PA and SA..

Participants

This study was developed in the context of the Epiteen (Epidemiological Health Investigation of Teenagers in Porto) cohort study [19-21]. This cohort was started in 2003/2004 with the objective to evaluate all teenagers born in 1990 and that were studying in one of the schools (private or public) in the city of Porto [20, 21]. At baseline, 2160 adolescents agreed to participate and provided information at least for part of the planned assessment, resulting in a 77.5% of participation. Among the 2160 baseline participants, 1716 participated in the second evaluation of the cohort, resulting in a proportion of re-evaluation of 79.4%.

From the total, 594 adolescents were excluded because they lived outside Porto, 15 didn't answer the questions about habits and activities from the school questionnaire and 339 were excluded because they didn't answer to the follow-up questionnaire. In the follow up, 277 new participants were recruited, corresponding to teenagers that were not studying in a school in Porto, during the baseline, but moved to the city in the meantime. Our final sample had 1489 teenagers, 765 (51.4) girls.

The Epiteen project has been approved by the Ethics Committee of the University Hospital of São João. Written information, explaining the purpose and the design of the study were sent to students and parents. Parents and children signed the informed consent form [19-21].

Questionnaire

The data were collected using two structured questionnaires, one responded at home with the help of parents, the other responded by the adolescents at school. The home questionnaire inquired information about characteristics of adolescents and the family including prenatal information, adolescent medical history, food intake, physical activity and family characteristics. The school questionnaire included information about physical activity, smoking and alcohol habits [19].

Socioeconomic data

Two indicators of the socioeconomic condition of the place of residence were used. One, the Socioeconomic Condition of the Place of Residence (SCPR) was calculated by principal components analysis, using variables at census tract level from the 2001 Portuguese National Census, with characteristics of buildings, dwellings, families, households, and individuals. After principal components analysis, cluster analysis was performed and census tracts were classified in three classes of homogeneous socioeconomic condition, High Class, Middle Class and Low Class.

The other place socioeconomic indicator was the Location Coefficient Assigned (LCA), from the directorate general of taxes of Portuguese financial ministry [22], which assigns a coefficient for each street, according to the price of the land. To each census tracts the value of the LCA was attributed.

Also parents education was used as a social indicator, measured in function of the number of years in school.

To attribute the value of the socioeconomic variables of the place of residence to each adolescent, a weighted average of the value of each census tracts that intersected a circumference of 25 meters around their residence was calculated. This approach allowed correcting for the cartographic error inherent to the georeferencing of residences and OSS.

Physical activity

As measure of physical activity it was used the self-perception of intensity of usual leisure time activities according to four subjective categories (mainly sitting, mainly standing, active or very active). For the analyses, participants were classified into two classes: Never/Low and Moderate/Vigorous.

Sports Activity

For sports activity we considered practicing some sport, outside of the compulsory school curriculum, independently of the frequency or intensity.

Volume of Breathless SA

Volume of Breathless Sport Activities (VBSA) measured the time that teenagers spent in sports activities after school, up to a point of being sweated or get out of breath. Three classes were created for girls and 4 classes for boys. First and second classes (equal for both sexes) were respectively: “never or ≤ 30 min” and “>30min and < 2h”. Third class was “≥ 2h” for girls and “≥2 h and < 4h” for boys. The forth class, only for boys, was “≥ 4h”. The definition of these classes was an approach to the WHO and the United States Centers for Disease Control and Prevention (CDC) recommendations for the ideal time of PA inthe youth [23-26]. As in studies reported by other authors [33], the exact classes recommended could not be followed because the VBSA among girls was very low [27].

Anthropometry

At school, weight and height were obtained with the subject in light indoor clothes and no shoes by a team of health professionals. The weight was measured with equipment with a bio-impedance (Tanita®), the participant on the center of the scale platform with the weight equally distributed on both feet. Height was measured with a portable stadiometer, the adolescent standing with

heels together and head positioned in the Frankfort horizontal plane (WHO, 1995).

Participants were classified according to the age and sex-specific BMI's percentiles developed by the CDC [28, 29]. Participants were considered as normal weight if BMI < 85th percentile and overweight if BMI equal or higher than 85th percentile [28, 30].

Asthma and Rhinitis

To identify Asthma and Rhinitis the written standardized questionnaire of the International Study of Asthma and Allergies in Childhood (ISAAC) (Portuguese Version) was used to collect data.

Georeferencing

The participant's residences were georeferenced by addresses within a GIS, using the digital map of Porto, containing all the street segments and ranges of numbers, pair and odd. The sports facilities were georeferenced using GPS.

The digital map with the limits of UGS was obtained from the Municipal Directorate of Information System, from the city Council. The map was updated by satellite images from Google earth and a field survey using a Global Positioning System (GPS) in order to include the UGS from the municipalities who shared a limit with the city of Porto, since the participants living close to the borders could be closer to UGS in neighborhood municipalities. Only spaces ≥ $2000m^2$ with free entrance were selected, being 71 UGS included in the study.

The list of public OSS was provided by the "PortoLazer", an administrative organ of the municipality of Porto, responsible for the leisure and sports facilities in the city. For this study were considered, the 46 outdoors public spaces, with sports equipments and that were free for use at any time, without any formal requirements.

Each participant was classified according to the distance of their residence to UGS and OSS into three classes: class 1 ≤250m, class 2 > 250m and ≤500m

and class 3 > 500m. Figure 1 and 2 shows the sample distribution according to the distances to UGS and OSS.

Statistical analysis

Qui-square tests were used to compare the proportions of categorical variables: Intensity of Physical Activity (IPA), Sports Activity (SA) and Volume of Breathless Sports Activity (VBSA) with the categorical variables: distances to UGS/OSS, Parents Education, Obesity, Asthma and Rhinitis, and SCPR.
Data of LCA were analyzed using the nonparametric Kruskal-Wallis and the Mann Whitney ($p<0.05$) to compare between groups in terms of IPA, SA and VBSA. To fit the best model, logistic regression analysis was used to estimate the relationship between distance to UGS/OSS, Parents' Education, Overweight/Obesity, Asthma, and Rhinitis and the risk of teenagers being physically active and sportily active. Odds ratio (OR) and the corresponding 95% confidence intervals (95%CI) were adjusted to BMI and Parents' Education when measuring the association with IPA and SA (for girls, adjusted only for Parents' Education). Each independent Variable was included by the "Enter" method to estimate associations with IPA and SA. All analyses were stratified by Sex.

RESULTS

The sample was composed by 765 girls and 724 boys. Boys had higher level of IPA in free time than girls, (62.9% vs. 38.5%, p<0.001) and were more engaged in SA (72.0% vs. 37.9%, p<0.01). Regarding VBSA, the boys also reported higher frequency than girls.
Regarding distances to UGS, 43.4% of the girls and 41.2% of the boys were in class 1 , 34.6% of the girls and 33.3% of the boys were in class2 and 22.0% of the girls and 25.6% of the boys were in class 3. Analyzing the distances from residences to OSS 26.0% and 22.0% of the boys were in class 1, 36.2% of the girls and 34.4% of the boys were in class 2 and 37.8% of the girls and 43.6% of the boys were in class 3.

Intensity of Physical Activity (IPA)

Table 1 summarizes the results regarding IPA according to the distances to UGS and OSS and some health and socioeconomic indicators. Despite that the proportion of those that practice moderate/vigorous physical activity decreases as the distance to UGS increases, no statistical significant associations were found between IPA, both boys and girls and distances to UGS and OSS.. Overweight/Obesity seems to be the most important factor associated with the intensity of physical activity.

Sport Activity (SA)

Considering the sports activity, independently of the intensity, we found that the majority (62.1%) of the girls and a bit more than one quarter (28.0%) of the boys did not practice sports. Socioeconomic indicators seem to be the strongest determinant for sports practice. Analyzing parents' education, it was observed that, in both sexes, the proportion of adolescents engaged in sports was higher among adolescents with parents with higher school level. No statistical significant associations were found between distances to UGS and OSS and practice of sports (table 2).

Volume of Breathless Sport Activity (VBSA)

Considering the VBSA, 24.8% of the girls (n=221) practiced ≥ 2 hours per week of some breathless sport activity (BSA). Among boys 22.8% (n=157) practiced ≥ 4 hours per week of BSA . The majority of the girls and boys who had higher VBSA lived closer (Class 1) of UGS. There was a non significant association between the distances to UGS and VBSA..

Those who reported to spend more time in BSA, both girls and boys, were more distant to OSS (class 3), There was a significant association between this distance to OSS and the higher VBSA.

Analyzing Parents' education, it was observed that, for both sexes, the proportion of adolescents that devoted more time to BSA is higher among adolescents with parents with higher school level. Table 3 summarizes the results regarding VBSA according to the distances to UGS and OSS and some health and socioeconomic indicators.

DISCUSSION

The principal aim of this study was to analyze the relation between distances from residences to UGS/OSS and the practice of PA of teenagers living in the city of Porto. In general, our data showed no association between the distance to this places and physical activity.

Other studies had examined the relationship between density and neighborhood access to UGS/OSS and PA and showed no consistent pattern of association between them [10, 31] [32]. In a recent review study of associations between PA and access to recreation areas, the authors showed that although the majority of reviewed papers presented some significant positive relationship between PA and recreation areas, a significant number showed mixed associations or no association [33, 34].

Some reasons may explain this result, one are relate with the characteristics more than physical proximity and that we did not evaluate such as, the size, attractiveness, security and adequacy of these spaces, are likely to be important [14, 35].

One other reason that could be related with the kind of sports supported by OSS aren't in line with adolescents preferences, namely for girls. In general girls prefer to participate much more in organized PA [7, 36], which were not available in this spaces. While in boys the design and safety does not seem to be a constraint, because the spaces seem more in line with their sports preferences and also they can adapt easier their PA and SA to these same spaces that offer more possibilities of practice different sports.

As reported by other studies, we found a higher percentage of boys engaged in sports and moderate/vigorous intensity of physical activity and practice more sports than girls. [37]. The other characteristics that found an association with physical activity or practice of sports were obesity and socioeconomic indicators as findings in Portugal had shown [36]. Also an European study confirm that there is a strong link between education and the amount of sport that people play, the data suggests that more highly educated EU citizens are, more physical fitness and more quality of life have [38].

So socioeconomic conditions were an important key for the SA, mainly in girls, because mostly of the organized SA are paid and charged and practiced in private clubs or in specific locations, such as gymnasiums, health-clubs, ballet schools and swimming pools that could be far from residences of most of the girls. This could explain the low adherence of girls in the practices of SA. So parents having a car or an alternative of transportation it's an important factor to the participation of the girls in SA and also show to be an socioeconomic indicator [36]. While in boys, a factor which may influence the relation between proximity to UGS/OSS and SA is that generally the boys practice SA in group, and maybe, they practice SA in the best looking and safety space that is near the residence of one of them but not from the others, causing them to move to areas away from home. The good socioeconomic condition in boys gives them the opportunity of practice SA, in a Club under supervision and in their favorite sport, making them more SA.

Limitations to our study were discovered during the developing of it, one limitation may be the spatial situation of the school, this may have more influence than the actual address of individuals, because they spent almost of their free time in the surrounding area.

UGS for our study may not be the most suitable for the practice of PA, we consider all green areas bigger than $2000m^2$ and those that are more accountable to the practice of PA, with a better design, greater security and good access, are reduced in number and are farther from the vast majority of our sample. This accessible UGS represents a potential resource that could be better utilized, with resulting benefits to health and perceptions of the environment [39, 40]. Although OSS does not seem to be sufficient for an area

as large as our city, so we should Georeference the surroundings OSS in the frontiers cities of Porto because a few of our teenagers lived in the frontier and the nearest UGS/OSS from their residences were out of Porto.

Conclusions

After adjustments, in both sexes, no significant association was found between the distance to UGS/OSS and physical activity. This data raised the importance to a better knowledge about the determinants of physical activity in adolescents, namely, to understand who make more physical active those adolescents apparently with neighborhood that allow the practice of sports but still inactives.

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Table 1: Prevalence of Intensity of Physical Activity in Leisure Times according to distances to UGS/OSS, Health indicators and Socioeconomic Indicators and results of logistic regression examining association between distances and odds of the intensity of Physical Activity

	PHYSICAL ACTIVITY, n (%)							
	FEMALE				MALE			
	Never/Low (61.5%)	Mod/Vigor (38.5%)	Crude OR (CI 95%)	Adjusted OR (CI 95%) *	Low (37.1%)	Mod/Vigor (62.9%)	Crude OR (CI 95%)	Adjusted OR (CI 95%)*
Distance to UGS								
≤ 250 m	183 (42.4)	124 (45.9)	Reference		96 (37.8)	187 (43.5)	Reference	
>250m a ≤500m	148 (34.3)	95 (35.2)	0.95 (0.67; 1.34)	0.99 (0.70; 1.42)	83 (32,7)	141 (32.8)	0.87 (0.61; 1.26)	0.85 (0.58; 1.24)
>500m	101 (23.4)	51 (18.9)	0.75 (0.50; 1.12)	0.81 (0.54; 1.24)	75 (29.5)	102 (23.7)	0.70 (0.47; 1.03)	0.69 (0.46; 1.03)
P-Value	0.36				0.19			
Distance to OSS								
≤ 250 m	113 (26.2)	73 (27)	Reference		62 (24.4)	84 (19.5)	Reference	
>250m a ≤500m	170 (39.4)	82 (30.4)	0.75 (0.50; 1.11)	0.75 (0.50; 1.13)	85 (33.5)	148 (34.4)	1.29 (0.84; 1.96)	1.30 (0.84;2.01)
>500m	149 (34.5)	115 (42.6)	1.20 (0.82; 1.75)	1.14 (0.76; 1.71)	107 (42.1)	198 (46.0)	1.37 (0.91; 2.05)	1.38 (0.90; 2.11)
P-Value	0.04				0.30			
Parents' Education								
Until 6th Year	131 (30.9)	68 (25.6)	Reference		63 (24.9)	97 (23.2)	Reference	
Until 9th Year	84 (19.8)	48 (18.0)	1.10 (0.7; 1.74)	1.11 (0.70; 1.78)	46 (18.2)	73 (17.4)	1.03 (0.63; 1.68)	0.98 (0.60; 1.61)
Secondary School	97 (22.9)	68 (25.6)	1.35 (0.88;2.07)	1.18 (0.76; 1.84)	61 (24.1)	112 (26.7)	1.19 (0.76; 1.86)	1.14 (0.72; 1.80)
College	112 (26.4)	82 (30.8)	1.41 (0.94; 2.12)	1.28 (0.84; 1.95)	83 (32.8)	137 (32.7)	1.07 (0.71; 1.63)	1.01 (0.65; 1.55)
P-Value	0.32				0.88			
Obesity								
< P85	341 (80.4)	235 (87.7)			186 (74.7)	353 (82.5)		
≥ P85	83 (19.6)	33 (12.3)	0.58 (0.37; 0.89)	0.58 (0.37; 0.92)	63 (25.3)	75 (17.5)	0.63 (0.43; 0.92)	0.62 (0.42; 0.91)
P-Value	0.02				0.02			
Asthma								
No	376 (89.5)	234 (89.0)			201 (85.5)	349 (88.1)		
Yes	44 (10.5)	29 (11.0)	1.06 (0.65;1.74)		34 (14.5)	47 (11.9)	0.80 (0.50; 1.28)	
P-Value	0.92				0.41			
Rhinitis								
No	394 (93.8)	241 (91.6)			214 (91.1)	371 (93.7)		
Yes	26 (6.2)	22 (8.4)	1.38 (0.77; 2.50)		21 (8.9)	25 (6.3)	0.69 (0.38; 1.26)	
P-Value	0.35				0.29			
Socioec Cond Pl Res								
High Class	127 (32.1)	85 (35.3)	Reference		81 (36.2)	136 (34.8)	Reference	
Middle Class	203 (51.3)	104 (43.2)	0.77 (0.53; 1.10)		114 (50.9)	202 (51.7)	1.06 (0.74; 1.51)	
Low Class	66 (16.7)	52 (21.6)	1,18 (0.75; 1.86)		29 (12.9)	53 (13.6)	1.09 (0.64; 1.85)	
P-Value	0.11				0.94			
Loc Coef Assign			0,90(0.53; 1,52)				1.06(0.63; 1.78)	
P-Value	0.94				0.63			

* Association to UGS/OSS with Intensity of Physical Activity was adjusted to parents' education and obesity

Table 2: Prevalence of Sport Activity out of school according to distances to UGS/OSS, Health indicators and Socioeconomic Indicators and results of logistic regression examining association between distances and odds of being Sport Activity

	SPORT ACTIVITY, n (%)							
	FEMALE				MALE			
	No (62.1%)	Yes (37.9%)	Crude OR (CI 95%)	Adjusted OR (CI 95%) *	No (28.0%)	Yes (72.0%)	Crude OR (CI 95%)	Adjusted OR (CI 95%) **
Distance to UGS								
≤ 250 m	187 (40.8)	130 (46.6)	Reference		79 (40.3)	209 (41.4)	Reference	
>250m a ≤500m	163 (35.6)	97 (34.8)	0.86 (0.61; 1.20)	0.84 (0.59; 1.21)	65 (33.2)	169 (33.5)	0.98 (0.67; 1.45)	0.90 (0.60; 1.35)
>500m	108 (23.6)	52 (18.6)	0.69 (0.47; 1.03)	0.70 (0.45; 1.07)	52 (26.5)	127 (25.1)	0.92 (0.61; 1.40)	0.85 (0.55; 1.31)
P-Value	0.19				0.93			
Distance to OSS								
≤ 250 m	133 (29.0)	62 (22.2)	Reference		49 (25.0)	101 (20.0)	Reference	
>250m a ≤500m	174 (38.0)	92 (33.0)	1.13 (0.77; 1.68)	0.95 (0.62; 1.45)	64 (32.7)	177 (35.0)	1.34 (0.86; 2.10)	1.25 (0.78; 2.01)
>500m	151 (33.0)	125 (44.8)	1.78 (1.21; 2.61)	1.34 (0.88; 2.05)	83 (42.3)	227 (45.0)	1.33 (0.87; 2.03)	1.12 (0.71; 1.76)
P-Value	0.01				0.35			
Parents' Education								
Until 6th Year	177 (39.9)	39 (14.0)	Reference		59 (31.2)	106 (21.4)	Reference	
Until 9th Year	86 (19.4)	48 (17.3)	2.53 (1.54; 4.16)	2.62 (1.59; 4.31)	39 (20.6)	81 (16.3)	1.16 (0.70; 1.90)	1.20 (0.73; 2.00)
Secondary School	101 (22.7)	74 (26.6)	3.33 (2.10; 5.26)	3.21 (2.02; 5.12)	39 (20.6)	140 (28.2)	2.00 (1.24; 3.22)	2.08 (1.27; 3.39)
College	80 (18.0)	117 (42.1)	6.64 (4.24; 10.4)	6.42 (4.08; 10.1)	52 (27.5)	169 (34.1)	1.81 (1.16; 2.82)	1.86 (1.17; 2.95)
P-Value	<0.001				0.01			
Obesity								
< P85	370 (82.4)	236 (84.9)			143 (74.5)	405 (80.7)		
≥ P85	79 (17.6)	42 (15.1)	0.83 (0.55; 1.25)		49 (25.5)	97 (19.3)	0.7 (0.47; 1.04)	0.66 (0.44; 0.99)
P-Value	0.44				0.09			
Asthma								
No	392 (88.9)	243 (88.7)			158 (86.8)	400 (86.8)		
Yes	49 (11.1)	31 (11.3)	1.02 (0.63; 1.65)		24 (13.2)	61 (13.2)	1.00 (0.61; 1.67)	
P-Value	1.00				1.00			
Rhinitis								
No	417 (94.6)	249 (90.9)			170 (93.4)	427 (92.6)		
Yes	24 (5.4)	25 (9.1)	1.74 (0.98; 3.12)		12 (6.6)	34 (7.4)	1.13 (0.57; 2.23)	
P-Value	0.08				0.86			
Socioec Cond Pl Res								
High Class	114 (27.8)	106 (41.6)	Reference		60 (35.9)	158 (34.4)	Reference	
Middle Class	213 (52.0)	114 (44.7)	0.58 (0.41; 0.82)		88 (52.7)	232 (50.5)	1.00 (0.68; 1.47)	
Low Class	83 (20.2)	35 (13.7)	0.45 (0.28; 0.73)		19 (11.4)	69 (15.0)	1.38 (0.77; 2.48)	
P-Value	=0.001				0.51			
Loc Coef Assign			2.46 (1.46; 4.14)				1.44 (0.80; 2.60)	
P-Value	<0.001				0.60			

* Association to UGS/OSS with Sport Activity was adjusted to parents' education

** Association to UGS/OSS with Sport Activity was adjusted to parents' education and obesity

Table 3: Prevalence of Volume of Breathless Sport Activity per week according to distances to UGS/OSS, Health indicators and Socioeconomic Indicators

	VOLUME OF BREATHLESS ACTIVITIES PER WEEK, n (%)								
	FEMALE				MALE				
	Never (47.0)	30m-<2h (28.2)	≥2 h (24.8)	P	Never (21.3)	30m-<2h (26.8)	≥2 h - <4h (29.1)	≥ 4h (22.8)	p
Distance to UGS									
≤ 250 m	138 (40.6)	93 (45.6)	101(45.7)		64 (43.5)	77 (41.6)	80 (39.8)	66(42.0)	
>250m a ≤500m	121 (35.6)	69 (33.8)	75 (33.9)		43 (29.3)	62 (33.5)	69 (34.3)	55(35.0)	
>500m	81 (23.8)	42 (20.6)	45 (20.4)	0.69	40 (27.2)	46 (24.9)	52 (25.9)	36(22.9)	0.94
Distance to OSS									
≤ 250 m	99 (29.1)	63 (30.9)	37 (16.7)		31 (21.1)	45 (24.3)	48 (23.9)	24 (15.3)	
>250m a ≤500m	137 (40.3)	61 (29.9)	79 (35.7)		46 (31.3)	80 (43.2)	67 (33.3)	45 (28.7)	
>500m	104 (30.6)	80 (39.2)	105 (47.5)	< 0.001	70 (47.6)	60 (32.4)	86 (42.8)	88 (56.1)	0.001
Parents' Education									
Until 6th Year	125 (38.1)	58 (28.4)	43 (19.7)		40 (27.8)	48 (26.5)	50 (25.6)	20 (12.8)	
Until 9th Year	63 (19.2)	43 (21.1)	37 (17.0)		31 (21.5)	29 (16.0)	38 (19.5)	23 (14.7)	
Secondary School	72 (22.0)	41 (20.1)	62 (28.4)		34 (23.6)	51 (28.2)	40 (20.5)	51 (32.7)	
College	68 (20.7)	62 (30.4)	76 (34.9)	<0.001	39 (27.1)	53 (29.3)	67 (34.4)	62 (39.7)	0.01
Obesity									
< P85	278 (83.5)	170 (83.7)	182 (83.1)		108 (74.5)	140 (77.8)	163 (81.9)	127(80.9)	
≥ P85	55 (16.5)	33 (16.3)	37 (16.9)	0.98	37 (25.5)	40 (22.2)	36 (18.1)	30 (19.1)	0.35
Asthma									
No	296 (88,6)	180 (90,9)	181 (87.0)		120 (88.2)	145 (84.8)	162 (88.0)	127 (87.0)	
Yes	38 (11,4)	18 (9,1)	27 (13.0)	0.46	16 (11.8)	26 (15.2)	22 (12.0)	19 (13.0)	0.78
Rhinitis									
No	313 (93.7)	185 (93.4)	192 (92.3)		128 (94.1)	155 (90.6)	173 (94.0)	135(92.5)	
Yes	21 (6.3)	13 (6.6)	16 (7.7)	0.81	8 (5.9)	16 (9.4)	11 (6.0)	11 (7.5)	0.58
Socioec Cond Pl ace Res									
High Class	96 (31.5)	51 (27.9)	79 (38.9)		41 (32.5)	64 (39.3)	57 (31.3)	57 (39.3)	
Middle Class	149 (48.9)	96 (52.5)	93 (45.8)		69 (54.8)	72 (44.2)	93 (51.1)	78 (53.8)	
Low Class	60 (19.7)	36 (19.7)	31 (15.3)	0.18	16 (12.7)	27 (16.6)	32 (17.6)	10 (6.9)	0.05
Loc Coef Assign *P-Value*				0.001					<0.001

FIGURE 1- 250m Buffer of UGS/OSS - Sample Distribution

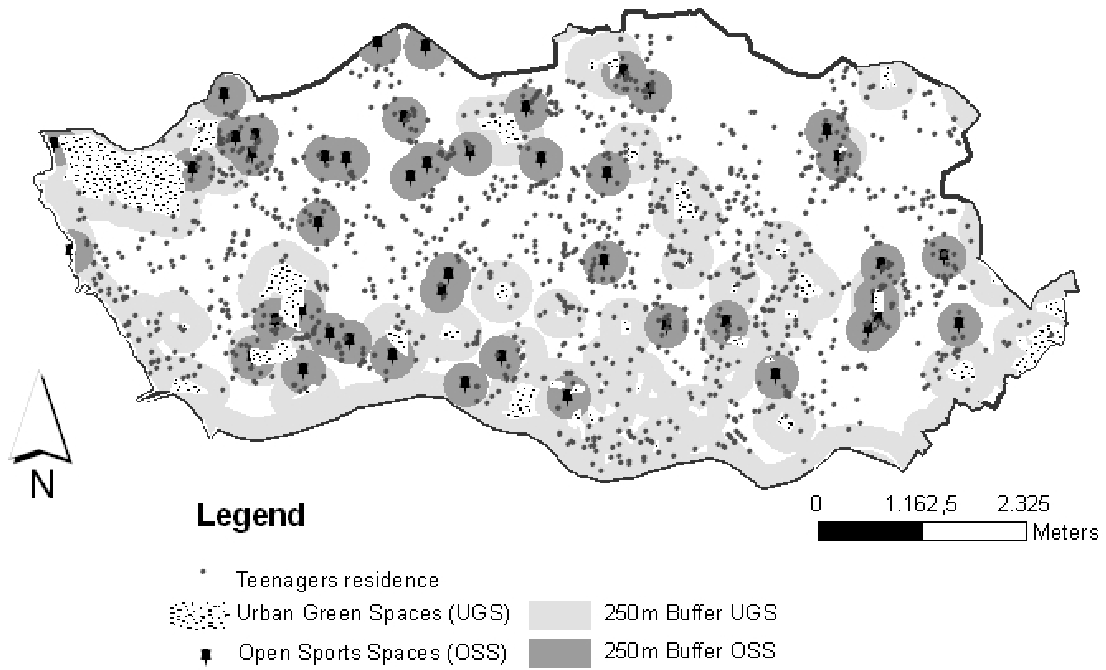
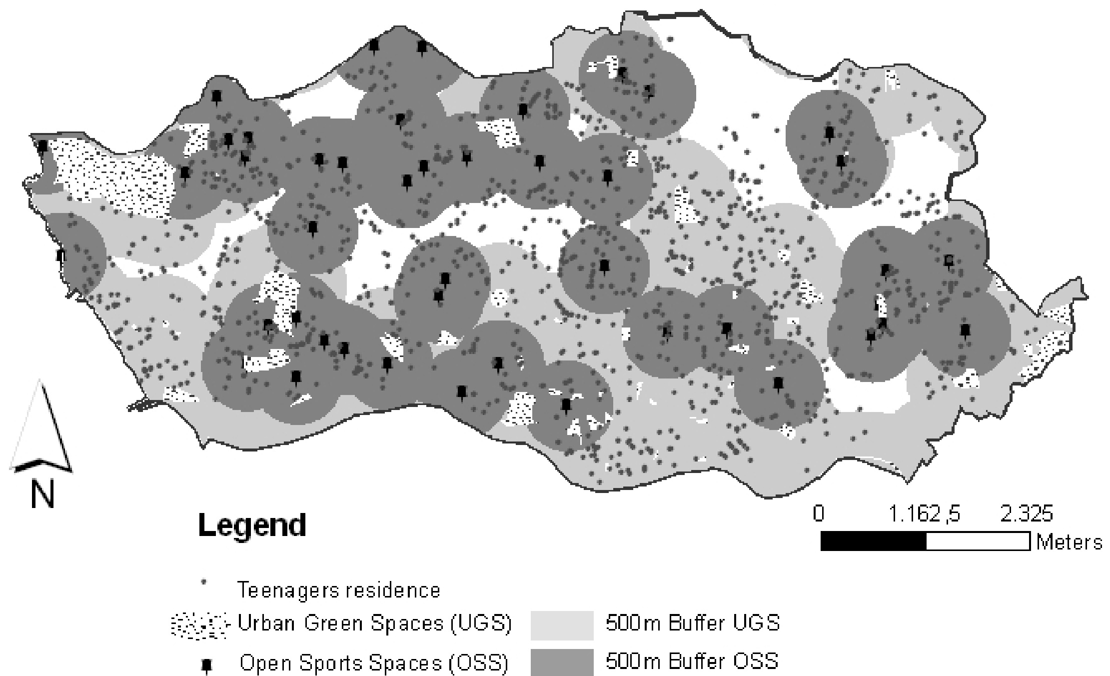


FIGURE 2- 500m Buffer of UGS/OSS - Sample Distribution



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Annexes

ANNEXES

UGS/OSS PHOTOS

TABLES

Table 4: Distribution per sex of the Sample by Dependent variables

DEPENDENT VARIABLES	SEX , n (%)		p-value
	FEMALE	MALE	
Intensity of Physical Activity			
Low	432 (61.5)	254 (37.1)	
High	270 (38.5)	430 (62.9)	<0.001
Sport Activity			
No	458 (62.1)	196 (28.0)	
Yes	279 (37.9)	505 (72.0)	<0.001
Volume Of Breathless Sport Activity			
< 30min	340 (47.0)	147 (21.3)	
≥30min-<2h	204 (28.2)	185 (26.8)	
≥2h (in girls) / ≥2h- <4h (in boys)	179 (24.8)	201 (29.1)	<0.001
≥4h	-------	157 (22.8)	

Table 5: Proportion of individuals living in the different distances

Class		FEMALE, n (%)	MALE, n (%)
U	d_class 1	332 (43.4)	298 (41.2)
G	d_ class 2	265 (34.6)	241 (33.3)
S	d_class 3	168 (22.0)	185 (25.6)
O	d_class 1	199 (26.0)	159 (22.0)
S	d_class 2	277 (36.2)	249 (34.4)
S	d_class 3	289 (37.8)	316 (43.6)

Table 6: Prevalence of Intensity of Physical Activity in Leisure Time s according to distances to UGS/OSS, Health indicators and Socioeconomic Indicators

	PHYSICAL ACTIVITY, n (%)					
	Females			Males		
	Never/Low (61.5%)	Moder/Vigor (38.5%)	p	Low (37.1%)	Moder/Vigor (62.9%)	p
Distance to UGS						
≤ 250 m	183 (42.4)	124 (45.9)		96 (37.8)	187 (43.5)	
>250m a ≤500m	148 (34.3)	95 (35.2)		83 (32,7)	141 (32.8)	
>500m	101 (23.4)	51 (18.9)	0.36	75 (29.5)	102 (23.7)	0.19
Distance to OSS						
≤ 250 m	113 (26.2)	73 (27)		62 (24.4)	84 (19.5)	
>250m a ≤500m	170 (39.4)	82 (30.4)		85 (33.5)	148 (34.4)	
>500m	149 (34.5)	115 (42.6)	0.04	107 (42.1)	198 (46.0)	0.30
Parents' Education						
Until 6th Year	131 (30.9)	68 (25.6)		63 (24.9)	97 (23.2)	
Until 9th Year	84 (19.8)	48 (18.0)		46 (18.2)	73 (17.4)	
Secondary School	97 (22.9)	68 (25.6)	0.32	61 (24.1)	112 (26.7)	0.88
College	112 (26.4)	82 (30.8)		83 (32.8)	137 (32.7)	
Obesity						
< P85	341 (80.4)	235 (87.7)		186 (74.7)	353 (82.5)	
≥ P85	83 (19.6)	33 (12.3)	0.02	63 (25.3)	75 (17.5)	0.02
Asthma						
No	376 (89.5)	234 (89.0)		201 (85.5)	349 (88.1)	
Yes	44 (10.5)	29 (11.0)	0.92	34 (14.5)	47 (11.9)	0.41
Rhinitis						
No	394 (93.8)	241 (91.6)		214 (91.1)	371 (93.7)	
Yes	26 (6.2)	22 (8.4)	0.35	21 (8.9)	25 (6.3)	0.29
Socioec Cond Place Residenc						
High Class	127 (32.1)	85 (35.3)		81 (36.2)	136 (34.8)	
Middle Class	203 (51.3)	104 (43.2)		114 (50.9)	202 (51.7)	
Low Class	66 (16.7)	52 (21.6)	0.11	29 (12.9)	53 (13.6)	0.94
Location Coefficient Assigned			0.94			0.63

Table 7: Results of logistic regression examining association between distances and odds of being Physical Activity				
	PHYSICAL ACTIVITY			
	Females		Males	
	Crude OR (CI 95%)	Adjusted OR (CI 95%)*	Crude OR (CI 95%)	Adjusted OR (CI 95%)*
Distance to UGS				
≤ 250 m	Reference		Reference	
>250m a ≤500m	0.95 (0.67; 1.34)	0.99 (0.70; 1.42)	0.87 (0.61; 1.26)	0.85 (0.58; 1.24)
>500m	0.75 (0.50; 1.12)	0.81 (0.54; 1.24)	0.70 (0.47; 1.03)	0.69 (0.46; 1.03)
Distance to OSS				
≤ 250 m	Reference		Reference	
>250m a ≤500m	0.75 (0.50; 1.11)	0.75 (0.50; 1.13)	1.29 (0.84; 1.96)	1.30 (0.84;2.01)
>500m	1.20 (0.82; 1.75)	1.14 (0.76; 1.71)	1.37 (0.91; 2.05)	1.38 (0.90; 2.11)
Parents' Education				
Until 6th Year	Reference		Reference	
Until 9th Year	1.10 (0.7; 1.74)	1.11 (0.70; 1.78)	1.03 (0.63; 1.68)	0.98 (0.90; 1.61)
Secondary School	1.35 (0.88;2.07)	1.18 (0.76; 1.84)	1.19 (0.76; 1.86)	1.14 (0.72; 1.80)
College	1.41 (0.94; 2.12)	1.28 (0.84; 1.95)	1.07 (0.71; 1.63)	1.01 (0.65; 1.55)
Obesity	0.58 (0.37; 0.89)	0.58 (0.37; 0.92)	0.63 (0.43; 0.92)	0.62 (0.42; 0.91)
Asthma	1.06 (0.65;1.74)		0.80 (0.50; 1.28)	
Rhinitis	1.38 (0.77; 2.50)		0.69 (0.38; 1.26)	
Socioec Cond Place Resid				
High Class	Reference		Reference	
Middle Class	0.77 (0.53; 1.10)		1.06 (0.74; 1.51)	
Low Class	1,18 (0.75; 1.86)		1.09 (0.64; 1.85)	
Location Coefficient Assigned	0,90(0.53; 1,52)		1.06(0.63; 1.78)	

* Association to UGS/OSS with Intensity of Physical Activity was adjusted to parents' education and obesity

Table 8: Prevalence of Sport Activity out of school according to distances to UGS/OSS, Health indicators and Socioeconomic Indicators

	SPORT ACTIVITY, n (%)					
	Females			Males		
	No (62.1%)	Yes (37.9%)	P	No (28.0%)	Yes (72.0%)	p
Distance to UGS						
≤ 250 m	187 (40.8)	130 (46.6)		79 (40.3)	209 (41.4)	
>250m a ≤500m	163 (35.6)	97 (34.8)		65 (33.2)	169 (33.5)	
>500m	108 (23.6)	52 (18.6)	0.19	52 (26.5)	127 (25.1)	0.93
Distance to OSS						
≤ 250 m	133 (29.0)	62 (22.2)		49 (25)	101 (20.0)	
>250m a ≤500m	174 (38.0)	92 (33.0)		64 (32.7)	177 (35.0)	
>500m	151 (33.0)	125 (44.8)	0.01	83 (42.3)	227 (45.0)	0.35
Parents' Education						
Until 6th Year	177 (39.9)	39 (14.0)		59 (31.2)	106 (21.4)	
Until 9th Year	86 (19.4)	48 (17.3)		39 (20.6)	81 (16.3)	
Secondary School	101 (22.7)	74 (26.6)	<0.001	39 (20.6)	140 (28.2)	0.01
College	80 (18.0)	117 (42.1)		52 (27.5)	169 (34.1)	
Obesity						
< P85	370 (82.4)	236 (84.9)		143 (74.5)	405 (80.7)	
≥ P85	79 (17.6)	42 (15.1)	0.44	49 (25.5)	97 (19.3)	0.09
Asthma						
No	392 (88.9)	243 (88.7)		158 (86.8)	400 (86.8)	
Yes	49 (11.1)	31 (11.3)	1.00	24 (13.2)	61 (13.2)	1.00
Rhinitis						
No	417 (94.6)	249 (90.9)	0.08	170 (93.4)	427 (92.6)	
Yes	24 (5.4)	25 (9.1)		12 (6.6)	34 (7.4)	0.86
Socioec Cond Place Residenc						
High Class	114 (27.8)	106 (41.6)		60 (35.9)	158 (34.4)	
Middle Class	213 (52.0)	114 (44.7)		88 (52.7)	232 (50.5)	
Low Class	83 (20.2)	35 (13.7)	0.001	19 (11.4)	69 (15.0)	0.51
Location Coefficient Assigned	1.384 (1.300;1.500)	1.429 (1.348;1.656)	<0.001	1.400 (1.300;1.553)	1.400 (1.321; 1.648)	0.595

Table 9: Results of logistic regression examining association between distances and odds of being Sport Activity

	SPORT ACTIVITY			
	Females		Males	
	Crude OR (CI 95%)	Adjusted OR (CI 95%) *	Crude OR (CI 95%)	Adjusted OR (CI 95%)**
Distance to UGS				
≤ 250 m	Reference		Reference	
>250m a ≤500m	0.86 (0.61; 1.20)	0.84 (0.59; 1.21)	0.98 (0.67; 1.45)	0.90 (0.60; 1.35)
>500m	0.69 (0.47; 1.03)	0.70 (0.45; 1.07)	0.92 (0.61; 1.40)	0.85 (0.55; 1.31)
Distance to OSS				
≤ 250 m	Reference		Reference	
>250m a ≤500m	1.13 (0.77; 1.68)	0.95 (0.62; 1.45)	1.34 (0.86; 2.10)	1.25 (0.78; 2.01)
>500m	1.78 (1.21; 2.61)	1.34 (0.88; 2.05)	1.33 (0.87; 2.03)	1.12 (0.71; 1.76)
Parents' Education				
Until 6th Year	Reference		Reference	
Until 9th Year	2.53 (1.54; 4.16)	2.62 (1.59; 4.31)	1.16 (0.70; 1.90)	1.20 (0.73; 2.00)
Secondary School	3.33 (2.10; 5.26)	3.21 (2.02; 5.12)	2.00 (1.24; 3.22)	2.08 (1.27; 3.39)
College	6.64 (4.24; 10.4)	6.42 (4.08; 10.1)	1.81 (1.16; 2.82)	1.86 (1.17; 2.95)
Obesity	0.83 (0.55; 1.25)		0.7 (0.47; 1.04)	0.66 (0.44; 0.99)
Asthma	1.02 (0.63; 1.65)		1.00 (0.61; 1.67)	
Rhinitis	1.74 (0.98; 3.12)		1.13 (0.57; 2.23)	
Socioec Cond Pl Res				
High Class	Reference		Reference	
Middle Class	0.58 (0.41; 0.82)		1.00 (0.68; 1.47)	
Low Class	0.45 (0.28; 0.73)		1.38 (0.77; 2.48)	
Location Coefficient Assigned	2.46 (1.46; 4.14)		1.44 (0.80; 2.60)	

*Association to UGS/OSS with Physical Activity was adjusted to parents' education

**Association to UGS/OSS with Physical Activity was adjusted to Parents' Education and Overweight/Obesity

Table 10: Prevalence of Volume of Breathless Sport Activity per week according to distances to UGS/OSS, Health indicators and Socioeconomic Indicators

	VOLUME OF BREATHLESS ACTIVITIES PER WEEK, n (%)								
	FEMALE				MALE				
	Never (47.0)	30m-<2h (28.2)	≥2 h (24.8)	P	Never (21.3)	30m-<2h (26.8)	≥2 h - <4h (29.1)	≥ 4h (22.8)	p
Distance to UGS									
≤ 250 m	138 (40.6)	93 (45.6)	101(45.7)		64 (43.5)	77 (41.6)	80 (39.8)	66(42.0)	
>250m a ≤500m	121 (35.6)	69 (33.8)	75 (33.9)		43 (29.3)	62 (33.5)	69 (34.3)	55(35.0)	
>500m	81 (23.8)	42 (20.6)	45 (20.4)	0.69	40 (27.2)	46 (24.9)	52 (25.9)	36(22.9)	0.94
Distance to OSS									
≤ 250 m	99 (29.1)	63 (30.9)	37 (16.7)		31 (21.1)	45 (24.3)	48 (23.9)	24 (15.3)	
>250m a ≤500m	137 (40.3)	61 (29.9)	79 (35.7)		46 (31.3)	80 (43.2)	67 (33.3)	45 (28.7)	
>500m	104 (30.6)	80 (39.2)	105 (47.5)	< 0.001	70 (47.6)	60 (32.4)	86 (42.8)	88 (56.1)	0.001
Parents' Education									
Until 6th Year	125 (38.1)	58 (28.4)	43 (19.7)		40 (27.8)	48 (26.5)	50 (25.6)	20 (12.8)	
Until 9th Year	63 (19.2)	43 (21.1)	37 (17.0)		31 (21.5)	29 (16.0)	38 (19.5)	23 (14.7)	
Secondary School	72 (22.0)	41 (20.1)	62 (28.4)		34 (23.6)	51 (28.2)	40 (20.5)	51 (32.7)	
College	68 (20.7)	62 (30.4)	76 (34.9)	<0.001	39 (27.1)	53 (29.3)	67 (34.4)	62 (39.7)	0.01
Obesity									
< P85	278 (83.5)	170 (83.7)	182 (83.1)		108 (74.5)	140 (77.8)	163 (81.9)	127(80.9)	
≥ P85	55 (16.5)	33 (16.3)	37 (16.9)	0.98	37 (25.5)	40 (22.2)	36 (18.1)	30 (19.1)	0.35
Asthma									
No	296 (88,6)	180 (90,9)	181 (87.0)		120 (88.2)	145 (84.8)	162 (88.0)	127 (87.0)	
Yes	38 (11,4)	18 (9,1)	27 (13.0)	0.46	16 (11.8)	26 (15.2)	22 (12.0)	19 (13.0)	0.78
Rhinitis									
No	313 (93.7)	185 (93.4)	192 (92.3)		128 (94.1)	155 (90.6)	173 (94.0)	135(92.5)	
Yes	21 (6.3)	13 (6.6)	16 (7.7)	0.81	8 (5.9)	16 (9.4)	11 (6.0)	11 (7.5)	0.58
Socioec Cond Plac Resid									
High Class	96 (31.5)	51 (27.9)	79 (38.9)		41 (32.5)	64 (39.3)	57 (31.3)	57 (39.3)	
Middle Class	149 (48.9)	96 (52.5)	93 (45.8)		69 (54.8)	72 (44.2)	93 (51.1)	78 (53.8)	
Low Class	60 (19.7)	36 (19.7)	31 (15.3)	0.18	16 (12.7)	27 (16.6)	32 (17.6)	10 (6.9)	0.05
Location Coefficient Assigned				0.001					<0.001