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06

il trasversale gioco dei saperi

nel progetto e nella promozione della città

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sommario

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Urban green spaces and their impact in the health of a population

Paula SANTANA, Rita SANTOS, Cláudia COSTA, Adriana LOURIERO

abstract

Walkable urban green spaces (WUGS) have immediate as well as indirect effects on health, improving not only the general health of the population but also the quality of the environment. However, in creating these new green urban places the health situation is not given due consideration. This article deals with the relationship between green urban places and physical exercise and the impact on public health in the city of Amadora, located in the metropolitan area of Lisbon. The results of this study show interesting relationships between the location of the green areas, the characteristics of the settlements and the types of greenery provided, indicating the necessity of an urgent interdisciplinary effort for the well-being of the future city.

Gli spazi verdi urbani e il loro impatto sulla salute della popolazione

Gli spazi verdi urbani pedonali hanno effetti diretti ed indiretti sulla salute, migliorando non solo lo stato generale di salute della popolazione ma anche la qualità ambientale. Tuttavia, nella realizzazione delle nuove aree verdi urbane non si tiene in dovuta considerazione questo fondamentale aspetto. Questo articolo evidenzia la relazione tra gli spazi verdi urbani, la pratica dell'esercizio fisico e l'impatto sulla salute pubblica nella città di Amadora, ubicata nell'area metropolitana di Lisbona. I risultati della ricerca hanno evidenziato interessati rapporti tra l'ubicazione delle aree verdi, i caratteri degli insediamenti e le tipologie di verde attrezzato, reclamando la necessità di un urgente lavoro interdisciplinare per la città futura del bene-essere.

Les espaces verts urbains et leur impact sur la santé de la population

Les espaces verts urbains pour piétons ont des effets directs et indirects sur la santé. Ils améliorent non seulement l'état général de la santé mais même la qualité de l'ambient. Toutefois, on a pas eu la considération due pour cet aspect fondamental dans la réalisation des nouvelles aires vertes. Cet article met en évidence la relation entre les espaces verts urbains, la pratique de l'exercice physique et l'impact sur la santé publique dans la ville d'Amadora, située dans la zone urbaine de Lisbonne. Les résultats de la recherche ont mis en évidence des rapports interessants entre la position des aires vertes, les caractères des installations et les typologies de vert équipé en réclamant la nécessité d'un urgent travail interdisciplinaire pour la future ville du bien-être.

Los espacios verdes urbanos y su impacto sobre la salud de la población

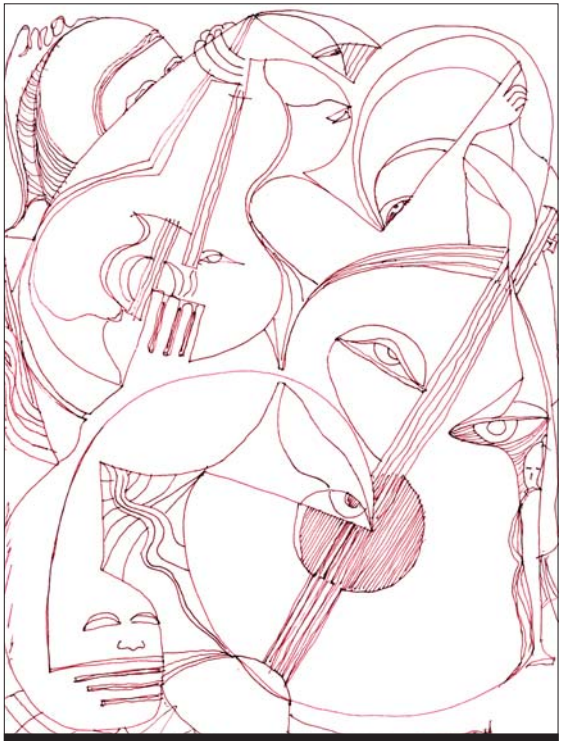
Los espacios verdes urbanos peatonales tienen efectos directos e indirectos sobre la salud, mejorando no solo el estado de salud general de la población sino incluso la calidad medioambiental. Sin embargo, en la realización de las nuevas áreas verdes urbanas no se tiene debidamente en consideración dicho aspecto fundamental. Este artículo evidencia la relación entre espacios verdes urbanos, la práctica del ejercicio físico y su impacto sobre la

salud pública en la ciudad de Amadora, ubicada en el área metropolitana de Lisboa. Los resultados del estudio han evidenciado correspondencias interesantes entre la ubicación de las áreas verdes, las características de los establecimientos y las tipologías de zonas verdes, reclamando la necesidad de un urgente trabajo interdisciplinar para la futura ciudad del bienestar.

Die staedtischen Gruenflaechen und ihr Einfluss auf die Gesungheit der Bevoelkerung

Die staedtischen Gruenflaechen haben direkten und indirekten Einfluss auf die Gesundheit. Sie verbessern nicht nur die Gesundheit der Bevoelkerung, sondern auch die Umweltsqualitaet. Dennoch wird dieser wesentliche Aspekt bei der Schaffung neuer Gruenflaechen nicht genug in Betracht gezogen. Dieser Artikel hebt die Beziehung zwischen Gruenflaechen, sportlicher Betaetigung und und ihrem Einfluss auf die Gesundheit in der Stadt Amadora (Lissabon) hervor. Die Risultate dieser Ermittelungen haben intressante Zusammenhaenge herausgestellt zwischen der Lage der Gruenflaechen,den Charakterzuegen der Ansiedlungen und der Art der Ausstattungen der Gruenflaechen,und haben so auf die Notwndigkeit einer dringenden interdisziplinaeren Arbeit fuer die zukuenfige “Wohlergehens stadt” hingewiesen.

La buona novella



Percorsi polisinfonici

Urban green spaces and their impact in the health of a population

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Introduction

The characteristics of the urban space (environmental, social and economic) and urban planning practices can affect (positive ou negatively) the well-being and health of the population (Barton & Tsourou, 2000; Frank, *et al.*, 2006). This aspect should orientate town planners and policy-makers by making them aware of the implications of their proposals and decisions upon the quality of life, well-being and health of the population. That is to say, the construction of the urban space should aim not only to improve the quality of the public space (constructed environment, mobility, etc.), but also to bring consequences as regards the quality of life and health of the residents and their communities (Wates & Knevitt, 1987; Ashton, 1992; Weinstein, 1998; Barton & Tsourou, 2000; Tzoulas, *et al.*, 2007; Schilling & Logan, 2008; Santana *et al.*, 2007a). For healthy urban planning, it is particularly important to ensure access to quality goods and services, and adequate public spaces with low levels of pollution (atmospheric, noise and visual), including urban green spaces, and to provide a comfortable, safe and efficient public transport service. To achieve this aim, it is necessary to evaluate the impact on health of actions (HIA), programmes or policies underlying the restricted field of health policies, such as the planning of urban green spaces.

The relationship between Walkable Urban Green Spaces (WUGS) and public health is a relatively new area of research. It has emerged due to associations between use of WUGS and the wellbeing of populations, revealed in recent years by studies that take account of factors such as self-assessed health status and longevity, after the control of individual, demographic and socioeconomic features (Takano *et al.,* 2002; Tanaka *et al.,* 1996; De Vries *et al.,* 2003; Maas *et al.*, 2006; Santana *et al.,* 2007a). Other authors have shown that WUGS have an indirect impact on health, improving air quality, and attenuating the effects of pollution and the "island of urban heat" (Whitford *et al.,* 2001; Alcoforado & Andrade, 2007; Vasconcelos & Vieira, 2007).

Finally, the use of WUGSs (facilitated by their proximity to residential areas) improves children's concentration and discipline in day-to-day activities, particularly in the female sex (Taylor *et al.*, 2001), alleviates urban stress (Ulrich, 1984; Nielsen & Hansen, 2007) and fatigue, bringing reductions in levels of aggression and violence (Kuo & Sullivan, 2001; Doyle *et al.*, 2006), and even influences relationships with neighbours, generating feelings of belonging to the neighbourhood or city (Kim & Kaplan, 2004).

However, given the many different types and forms of WUGS that exist, the relationship between these spaces, the practice of physical activity and health has not yet been clearly demonstrated (Tzoulas *et al.,* 2007; Nielsen & Hansen, 2007). There is, then, an urgent need to focus attention upon aspects of the constructed urban environment that promote

or inhibit physical activity, with direct or indirect consequences upon health (Doyle *et al.*, 2006; Jones *et al.*, 2010).

The aim of this paper is to identify if: 1) the existence of green spaces in the vicinity of residential neighbourhoods encourages physical exercise, walking and recreational activities; 2) there are interrelationships between levels of physical activity and health status.

Data and Methods

Amadora was chosen as the area of study (Figure 1) because, in a study into the spatial distribution of certain indicators of wellbeing in the Lisbon Metropolitan Area, presented particularly extreme scores respecting clusters of sociomaterial deprivation (with low educational levels, prevalence of unskilled work or unemployment amongst males, etc. - Santana *et al.*, 2008b: 167).

The study drew upon information from several sources: 1) data published by Amadora City Council (location of facilities, maps, orthophotomaps, reports, etc), and by the National Institute of Statistics (demographic, economic and other figures concerning the statistical subsection 'neighbourhood'); 2) two surveys, one about with lifestyle, perception of place and health status, which was administered to residents in the county (N=1200 questionnaires), and another directed at users (N=250) of the three biggest parks in Amadora (Central Park, Adventure Park and Delfim Guimarães Park).

The influence of the WUGS characteristics in is use have been studied through the Spearman correlation coefficient, calculated between the classification of the WUGS characteristics and the main motivation to the user of the park, according to the methodology defined by Foster and Others (2007). The relations presented are those that reveal statistical significancy in the Pearson's chi-square test.

The Geographical Information System (GIS) was used to assess the size and dimensions of the green spaces in question and their respective distances from the population of potential users. WUGS accessibility areas were constructed using the extension *Network Analyst* of the electronic platform *ArcGIS 9.2* (ESRI), and with the function *Service Area*, various accessibility levels were identified (walking at an average speed of 3Km/h) via a network of paths, using analysis intervals of 0-3, 3-5, 5-10 and 10-15 minutes. It was also possible, with the *Closest Facility* function, to assess the distance on foot between the centre of each neighbourhood and the nearest WUGS (Santana *et al.*, 2007b; Santana *et al.*, 2009).

Figure 1.
Location of Amadora in the Lisbon Metropolitan Area.

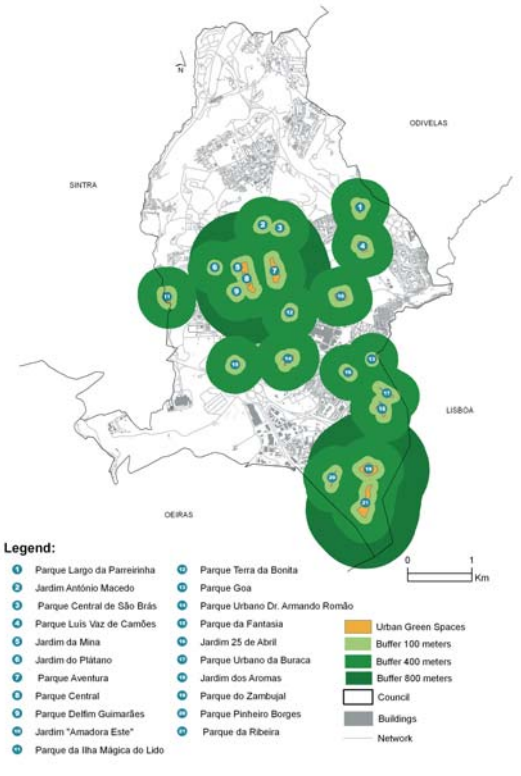

Figure 2a. Location and Buffers of the main urban green spaces in Amadora.

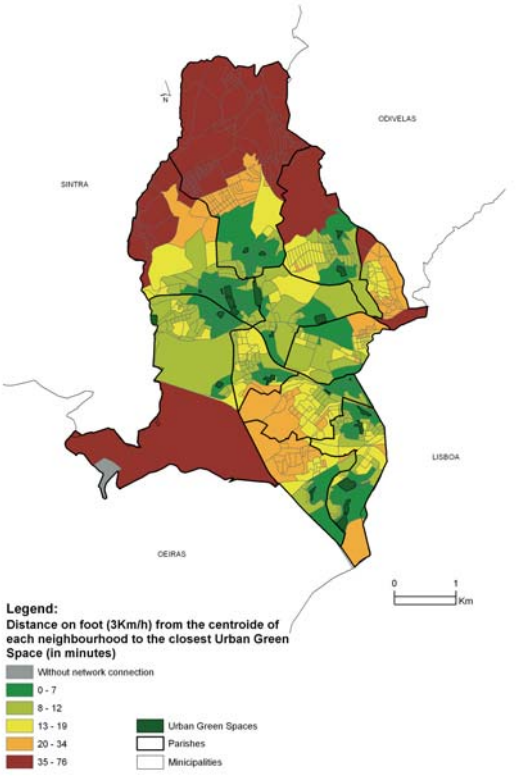

Figure 2b. Distance walking (in minutes) from the residencial areas to closest urban green space.

Provision and use of urban green spaces and health in Amadora

According to Tzoulas *et al.* (2007), the desirable global score for the urban green structure is 40m²/inhabitant, which is the ratio necessary to maintain the equilibrium of the urban ecosystem and the health of the population (Bernatzky, 1966). In Amadora, this index is 2.3 m²/inhabitant (according to information provided by the City Council); thus, the city is very deficient in this type of infrastructure (Figure 2a).

At the geographical accessibility level, it was verified that 40,9% of the population of this municipality lives less than 800 meters from a main WUGS and that only 12% of the population lives less than 100 meters from a secondary WUGS (figure 2a). Besides that, in an analysis of the distance walking (in minutes) from the residencial areas to closest urban green space, it was verified that 47,6% of the population lives less that 15 minutes of a WUGS (figure 2b).

Despite this, over half the Amadora population (57%) claim to use an WUGS on a weekly basis. Of those, 74% use the one that is nearest to their place of residence. The questionnaire administered to the resident population of Amadora sought to identify those characteristics that significantly influenced the practice of physical exercise (Santana, *et al,* 2007a). Those

characteristics were: gender (men tended to do more physical exercise than women); marital status (single people were more active physically than married people), and professional status (students recorded the highest levels of physical activity). The last two categories indirectly reflect the age of the individuals concerned, as the practice of physical activity is significantly higher amongst individuals in the lowest age bracket (i.e. between 14 and 24 years).

As regards the factors that influence the use of UGS, the questionnaire directed at users of green spaces revealed that motivation was affected by the physical features of those spaces (Table 1). It was found, for example, that the use of parks in order to "go for a walk, relax or get some exercise" was directly and significantly correlated with the availability of spaces for informal games (0.234), collective sports (0.234) and walking (0.234), the existence of signposts (0.234) and the absence of vandalism (0.234).

Feature of green spaces	**Main reason for using green spaces**						
	Walking the dog	**for a walk to relax a nd get some exercise**	**Route between two points**	**Doing sport**	**Looking at the landscape**	**Relaxing and picnicking**	**Getting some sun**
Paths in good state of conservation	0.084	0.148	-0.306*	0.093	0.158*	0.000	0.276*
Green spaces for informal games	0.112	0.234*	-0.173*	0.057	0.137	-0.029	0.016
Natural open green space	0.084	0.148	-0.306*	0.093	0.158*	0.000	0.276*
Significant number of trees	-0.038	-0.041	0.280*	-0.083	-0.117	-0.018	-0.338*
Activity signposting	0.038	0.041	-0.280*	0.083	0.117	0.018	0.338*
Restriction signposting	-0.039	-0.112	-0.138	0.037	0.016	0.035	0.290*
Safety signposting	-0.039	-0.112	-0.138	0.037	0.016	0.035	0.290*
Quality of signposting	0.084	0.148	-0.306*	0.093	0.158*	0.000	0.276*
Existence of signposting panels	0.112	0.234*	-0.173*	0.057	0.137	-0.029	0.016
Existence of lighting	0.084	0.148	-0.306*	0.093	0.158*	0.000	0.276*
Suitability for collective sports	0.112	0.234*	-0.173*	0.057	0.137	-0.029	0.016
Suitability for informal sports	0.112	0.234*	-0.173*	0.057	0.137	-0.029	0.016
Suitability for walking	0.084	0.148	-0.306*	0.093	0.158*	0.000	0.276*
Suitability for running	-0.039	-0.112	-0.138	0.037	0.016	0.035	0.290*
Transmits sense of safety	0.038	0.041	-0.280*	0.083	0.117	0.018	0.338*
Maintenance/cleaning of green and grey spaces	-0.039	-0.112	-0.138	0.037	0.016	0.035	0.290*
Signs of vandalism	-0.112	-0.234*	0.173*	-0.057	-0.137	0.029	-0.016
Existence of other (non-natural) attractions	0.110	0.217*	-0.256*	0.081	0.161*	-0.018	0.144

Table 1: Correlations between the features of green spaces and the main reasons for using them.
*Note: * significance correlation (p-value <0.05)*

Indeed, signs of vandalism proved to be particularly important, revealing a negative correlation with "go for a walk to relax and get some exercise" (-0.234). Hence, this factor appears to inhibit the use of such spaces for the purposes of sports or walking (and according to the WHO, walking is an important part of a healthy daily routine).

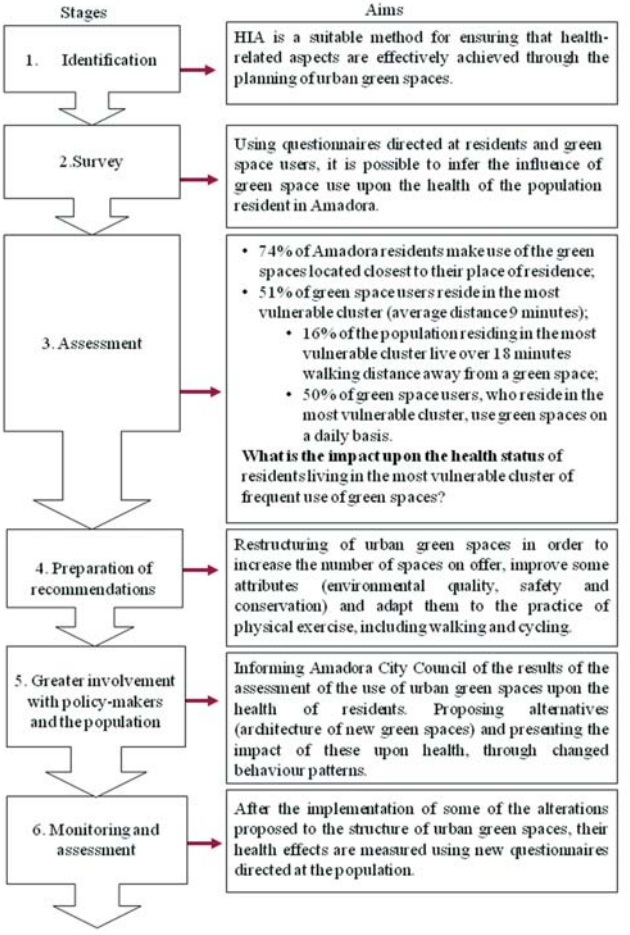

Figure 3
Environmental Impact Assessment to Walkable Urban Green Spaces in Amadora, Portugal.

The factors that influenced the use of WUGS for the purpose of "getting some sun" did not differ substantially from those indicated for "going for a walk to relax or get some exercise". There was, therefore, a positive correlation between the reason "getting some sun" and the good state of conservation of the pathways (0.276), the existence of natural green open spaces (0.276), adequate signposting (indicating activities, restrictions and safety) and also the existence of spaces suitable for walking (0.276) and running (0.290).

The relationship between the use of green spaces and self-assessed health status was analysed in Santana and others (2007b). It was found that individuals that made use of the WUGS were 40% more likely to present a positive health assessment to those that did not. Similarly, individuals that sought out green spaces for physical exercise also had a more positive notion of their own health status (Santana *et al*, 2007a).

Improving public health by intervening in urban green spaces | Green Spaces: Stages in Health Impact Assessment (HIA)

The aim of the analysis described below was to clarify the impact of accessibility (understood as the capacity to overcome barriers, such as distance) and the quality of WUGSs on the health of the residents of Amadora. This paper constructs scenarios (logical/causal model) which prospectively indicate health alterations that might become evident in Amadota, by the components relating to WUGS and assessed with regard to their impact upon health (self-assessede health status).

The following conclusions were particularly relevant for HIA: i) The provision of UGS in the county of Amadora is not adequate for the size of the population (15% of what would be desirable[1]); ii) 57% used the UGS on a weekly basis; iii) The use of UGS is associated to proximity, irrespective of gender, age or socioeconomic factors; iv) health status improves with use of UGS; v) there is a strong correlation between the use of UGS and environmental quality (state of conservation and safety), in addition to geographical accessibility.

We proceeded to assess the health impact of restructuring different aspects of WUGS (geographic accessibility, safety, state of conservation and suitability for walking) on the basis of the evidence derived from the surveys of the resident population and green space users performed in the county. The stages of the HIA are described in Figure 3.

1 Using DGOTDU criteria (Magalhães, 1992).

It was found that 74% of Amadora residents questioned used the park nearest to their place of residence. The impact of the frequency of WUGS use upon the health equity of residents was assessed using the most vulnerable cluster (in sociomaterial terms), as this was the group with the worst health results (self-assessed health status, excess weight and obesity, and alterations in emotional state – Santana *et al.* 2007b) and constituted 51% of green space users. Taking this as a premise (frequency of green space use by the population in the most vulnerable cluster), we aimed to assess the impact of this frequency on the health of its residents.

One of the presuppositions included in this model was that the geographic accessibility of a WUGS strongly determines its frequency of use. A logical chain of events was associated to the health status self-assessment model (Santana *et al.* 2007b); it thus became possible to assess or predict the potential effect of improving the conditions of green spaces (increasing accessibility and improving aspects of environmental quality, such as conservation and safety) upon the health of the residents in the most vulnerable cluster (since 20% of this cluster in less than 15 minutes of one WUGS).

Health impact is predicted by simulating (on the self-assessed health status model) the possibility of all residents in the highest vulnerability cluster start using the WUGS.

This variation is induced by increasing the provision of WUGSs and, potentially, the frequency of use. It was found that this led, *ceteris paribus*, to an improvement in the self-assessed health status for 29% of residents (Figure 4).

The following proposals aim to improve the accessibility and quality of WUGS in the county of Amadora, with direct and indirect implications upon the physical and mental health of the population, and also to attract people to the "centre" of the city.

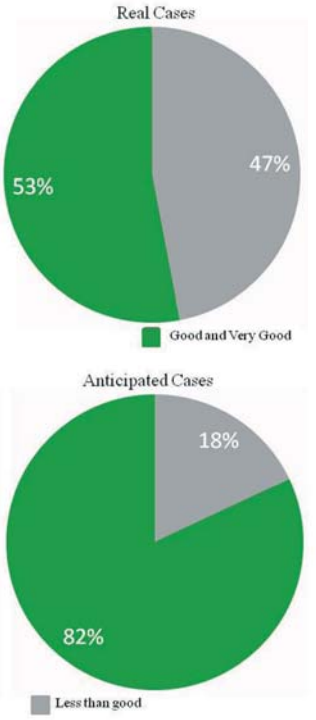

Figure 4
Variation in self-assessed health status simulating the frequency (potential of 100%) of green spaces on the part of residents in the highest vulnerability cluster.

Discussion of results and proposals for improving Walkable Urban green spaces in order to better respond to the needs of the population

According to Milano and Dalcin (2000), WUGS allow contact with nature and the use of a healthy environment: should contribute to bioclimatic, atmospheric and noise control and they should also help improve the visual appearance of the city. They can also help compensate for poor housing conditions, encourage social interaction between different groups and, as part of the city's heritage, stimouate feelings of belonging and promote the physical activity.

Like other authors (Takano *et al.*, 2002; Tanaka *et al.*, 1996; de Vries *et al.*, 2003), we found that WUGS have both a direct impact upon health through the association with self-assessed health status, and an indirect impact though the improvement in environment quality. For example, the proximity of WUGS to people's residences has indirect impacts on health, providing a physical environment that encourages physical exercise, including walking. Pikora *et al.* (2003) and Humpel *et al.* (2004) also provide evidence of this association, which remains constant in the face of demographic and socioeconomic factors (sex, age, and education or training), whose role in physical activity has been clearly demonstrated. Other authors have pointed out that the use of UGSs (which is facilitated when they are located near to the place of residence) alleviates urban stress (Ulrich, 1984) and fatigue (Taylor *et*

al., 2001) and even influences the capacity to get on with one's neighbours (Kim & Kaplan, 2004), and these observations were also supported by our findings in Amadora.

In this study, it was concluded that the use of WUGSs was determined by geographic accessibility, aesthetic factors, maintenance, and the existence of signposts and lighting. In addition to these, perceptions of safety were also important. The identification of the most relevant aspects as regards to the use of WUGS helps focus interventions with a view to maximising use potential. It also increases our knowledge of the relationship between the provision of UGS, the practice of physical exercise and health, although these associations are not easily demonstrated, as has been pointed out by some authors (Tzoulas *et al.*, 2007).

In Amadora, it is possible to improve health by increasing the provision/use of WUGS, and this may be achieved by making use of abandoned agricultural and forestry areas (which account for almost 38% of the territory).

In the last 40 years, the pace of housing construction in Amadora has been high, but has not been accompanied by a parallel construction of WUGS. In fact, there is no ecological continuity that contributes to the environmental sustainability of the city.

Studies have already been carried out into the existing WUGS in Amadora, and have pointed out the need for intervention, especially at the level of environmental and social performance (Santana *et al.,* 2007a).

Some proposals

The following proposals concern the restructuring of existing WUGSs and the creation of new ones (Figure 7). Examples of what could be constructed, in response to the previously-identified needs, are: small parks near residential areas; urban allotments; demarcation hedges; small woodland areas; ecological corridors near waterways or inside parks and public gardens, green corridors, etc.

These may be constructed in forestry areas which provide real opportunities for the county to overcome its UGS deficit and low levels of tree shade. They may be considered as spaces for recreation and leisure (including the practice of physical exercise) or as walking or cycling routes between different parts of the city (home to work or school / leisure to home). Indeed, walking and cycling, which may and should be practised by individuals of all ages, have a positive cost/benefit ratio for health, and the provision of green spaces for these activities should be increased. However, these should be analysed and prioritised by policy-makers and the public. The proposals simultaneously bridge the needs for WUGS near the population (97% of the population are within 400m of a WUGS) and the need to spread the WUGS around the county, creating territorial cohesion and responding to the planned urbanization schemes.

Another proposal is to construct an attractive green centre, which would restore public space by building over the railway line. In addition to the results identified (i.e. improvements in physical and mental health), this new space would make the city centre more attractive, and generate feelings of civic pride and belonging. Such a centre would draw together adjacent urban features, giving coherence to what would otherwise be no more than an amalgam of concrete blocks.

Figure 5
Some proposals of new WUGS. Source: Elaborated from ortophotomap assigned by Amadora Municipality Administration, 2003.

1 and 11: Protected waterways.

2 and 28: Urban park.

3: Leisure park in the Fonte das Avencas Wood
4, 5, 8, 9, 14, 15, 18, 21 and 22: small parks near residential areas.

6: Conversion of former rubbish dump into urban park.

7: Protected museological place.

10: Green park and urban allotments near a football field.

12: Two urban parks, joined together.

13 and 20: Urban park with children's play area.

16: Rehabilitation of the garden with reduction of the grey space.

17: Rehabilitation of abandoned farmland.

19, 24 and 25: urban allotments.

23: Rehabilitation of the Palace of the Count of Lousã and adjacent gardens.

26: Green park and urban allotments surrounding the Hospital and two new urbanizations nearby.

27: Rehabilitation of the urban park.

The green corridors connect the urban spaces by means of pedestrian and bicycle pathways, and offer an incentive for the population to use these structures, while taking advantage of the green spaces provided. However, they should be considered leisure spaces or spaces of transition (by bicycle or on foot) between residential areas, schools and work places, and not only as mere street decoration.

Our results are therefore in accordance with those found by other researchers worldwide. Interventions that aim to encourage the practice of physical activity (including walk) have not had the hoped-for impact: the type of interventions (spaces barred to the public at large, such as parks and sports facilities) have left much of the population without access to their benefits, bringing fewer long-term positive effects, with consequences upon public health. That is to say, if the intervention is directed only at the infrastructure, without taking account of surrounding spaces or potential users, the aims of that intervention may not be achieved. However, the effects of green spaces upon the health of the city and health in the city cannot be generalised. For example, deserted or vandalized green spaces may have negative effects upon public wellbeing, increasing anxiety due to the fear of crime (Kuo *et al.,* 1998).

As for Amadora, the size of the county (24 km^2) may prove to be an advantage, provided that there is not too much delay in adapting it to the needs of human life (mobility on foot or by bicycle; interpersonal and intergenerational relations; contact with the green space to release tensions and recover energy, etc). All in all, it is possible to recover the human dimension of the city in Amadora!

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Alla ricerca delle pari opportunità

Alla ricerca di rapporti armonici

Prendere in mano la situazione

Rapporti di buon vicinato