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To cite this article: I. Mourão, M. C. Moreira, T. C. Almeida & L. M. Brito (2019) Perceived changes in well-being and happiness with gardening in urban organic allotments in Portugal, *International Journal of Sustainable Development & World Ecology*, 26:1, 79-89, DOI: [10.1080/13504509.2018.1469550](https://doi.org/10.1080/13504509.2018.1469550)

To link to this article: <https://doi.org/10.1080/13504509.2018.1469550>



Published online: 01 May 2018.



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Perceived changes in well-being and happiness with gardening in urban organic allotments in Portugal

I. Mourão ^a, M. C. Moreira^b, T. C. Almeida ^c and L. M. Brito ^a

^aMountain Research Centre (CIMO)/Instituto Politécnico de Viana do Castelo, Escola Superior Agrária, Refóios, Ponte de Lima, Portugal; ^bMunicípio de Vila Nova de Famalicão, V. N. de Famalicão, Portugal; ^cInstituto Universitário Egas Moniz, Caparica, Portugal

ABSTRACT

Urban allotment gardens (AG) in Portugal have increased in recent years, as in many other European countries and worldwide. The contribution of these gardens to the happiness and well-being of urban populations has been recognized, but evaluations of their benefits are still very scarce. The objective of this study was to evaluate this contribution, based on the urban organic AG of the Devesa Park in Vila Nova de Famalicão, Portugal. The sample included 65 gardeners who completed the self-administered questionnaires of *Bem-Estar Pessoal* (personal well-being scale), *Felicidade Subjetiva* (subjective happiness scale) and sociodemographic characteristics. Respondents were mainly adults under 65 years, married and academically well qualified and about half of them had a professional activity, with nearly one third being retired. They considered themselves happy with their life (Personal Well-being Index = 74.5%) and revealed an optimistic and positive attitude towards life, regardless of economic or social difficulties. The increased frequency of visits for gardening was positively related to a greater perception of subjective happiness. The gardeners who visited the AG more frequently considered themselves happier from a self-perspective and in comparison with peers. It can be suggested that urban organic AG represent a means for enhancing citizen well-being, contributing positively to their feelings of happiness and life satisfaction, changing behaviours and developing personal capacities. Beyond economic measures, urban AG can be recommended to capture the well-being of societies.

ARTICLE HISTORY

Received 18 January 2018
Accepted 20 April 2018

KEYWORDS

Urban agriculture; organic production system; life satisfaction; subjective happiness scale; personal well-being scale

Introduction

Throughout the history of humanity, small vegetable gardens for the urban populations assumed important economic, social and environmental functions. Literature has shown that urban horticultural spaces have an impact on the quality of life and well-being of populations, with the perception of a wide range of benefits in health and on individual and community well-being (Davies et al. 2014).

Urban vegetable gardens are essentially a support to urban populations in times of economic and social hardship and food shortages, such as the urban allotments in many European countries in the last decades (EUGO 2012; Bryant et al. 2016; Delgado 2017; Partalidou and Anthopoulou 2017) or the Victory gardens in the Second World War (Lawson 2005). In many countries, urban gardens increased with the rapid growth of cities (De Bon and Parrot 2010) and urban agriculture plays a relevant role for different aspects of the society. Its variety of functions and typologies seek to respond to the needs of the territories and populations where they are inserted, in specific temporary spaces or becoming members of the urban space itself. In fact, the present city concept

is of an enlarged city, composed of urban, rural/urban and agricultural/forest spaces, where the allotments integrated in the green city structure establish ecological infrastructures (Simon-Rojo et al. 2016). This urban design, based on the maintenance of multi-functional landscapes and different ecosystem services, will be the key to the development of cities that are more resilient and more capable to contribute to the well-being of the population and their quality of life (FAO 2012).

The practice of organic production system in urban gardens is highly recommended because of the need to respect ecosystems and preserve them for future generations, as well as representing an adequate alternative food production system, promoting healthy eating and minimizing risks to environmental degradation. These are widely recognized, with a good example being the urban organic vegetable garden network of Barcelona (EUGO 2012; Simon-Rojo et al. 2016) or the urban community gardens in Wisconsin, USA (Ghose and Pettygrove 2014).

Urban gardens provide economic, social and environmental benefits, including food production (Morgan 2013; Mougeot 2015), health promotion and physical exercise, education and cultural

promotion, leisure, impact on urban ecosystems and reduction of the carbon footprint (e.g. Axel et al. 2016), and also support therapeutic, re-educational and social integration activities (Mourão et al. 2014). The therapeutic benefits of gardens and garden environments are currently accepted as an effective and beneficial therapeutic modality (Thrive 2012; AHTA 2014), and it is recognized by health professionals and the scientific community that gardening and horticulture have beneficial effects on health and well-being (Relf et al. 1992; Armstrong 2000; Sempik et al. 2003; Twiss et al. 2003; Catanzaro and Ekanem 2004; Stigsdotter and Grahn 2004; Waliczek et al. 2005; Davies et al. 2014).

Quality of life is an eminently human notion, which approximates the degree of satisfaction found in family, affective social life and even existential aesthetics (Minayo et al. 2000). The World Health Organization (WHO 1997) defines quality of life as an 'individuals' perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, level of independence, social relationships, personal beliefs and their relationship to salient features of their environment'.

There are some indicators of quality-of-life evaluation influenced by variables such as age, gender, socioeconomic status and training. However, research shows that objective circumstances, demographic variables, and life events are correlated with happiness less strongly than intuition or everyday experience (Lyubomirsky and Lepper 1999; Lyubomirsky 2001). Evidence suggests that changing one's life circumstances is not the most fruitful path to greater well-being and that happiness improvements have been found with simple cognitive and behavioural strategies that people can employ in their daily lives (Sin and Lyubomirsky 2009). In addition, it can be identified that some people are chronically happy, even in the face of adversity and others are consistently unhappy, despite the best of circumstances (Myers and Diener 1995).

Subjective well-being (SWB) can be analysed in two components: the affective well-being, which refers to the presence of pleasant affect (e.g. feelings of happiness) and the absence of unpleasant affect (e.g. depressed mood), and the cognitive well-being, which refers to the cognitive overall evaluation of life (global life satisfaction), as well as specific life domains (e.g. job satisfaction or marital satisfaction) (Busseri and Sadava 2011; Luhmann et al. 2012). Well-being can thus be framed as the emotional and cognitive assessment that people make of their lives and include what usually is called as happiness, peace, fulfilment and satisfaction with life (Pais-Ribeiro and Cummins 2008). The concept

of SWB intercepts domains of social psychology, health psychology and clinical psychology, and is seen as a positive dimension of health (Galinha and Pais-Ribeiro 2005). SWB is thus a broad umbrella term that refers to all different forms of evaluating one's life or emotional experience, such as satisfaction, positive affect and low negative affect (Diener et al. 2017a).

The degree of satisfaction and happiness of individuals from a cognitive and affective point of view, at a given moment as a result of participating in activities such as gardening in urban allotment gardens (AG), allows understanding and evaluation of well-being and quality of life. This was the main objective of this study, through the application of the *Bem-Estar Pessoal* scale (personal well-being scale) (Pais-Ribeiro and Cummins 2008) and the *Felicidade Subjetiva* scale (subjective happiness scale) (Pais-Ribeiro 2012), both validated for the Portuguese population and socio-demographic characteristics. The study was developed in the urban organic AG of the Devesa Park in V.N. Famalicão. In Portugal, urban agriculture includes AG, urban farms and short food chains, which generally run on public and institutional land and are mainly supported by municipalities (Delgado 2017), which is the case of the Devesa Park.

Methodology

Participants

The urban organic AG of the Devesa Park, in the North of Portugal, is integrated in the park green area, with access reserved for gardeners (Figure 1). The garden includes 192 family plots of 25 m²/plot, 6 raised plots of 4 m²/plot, 3 plots of 100 m²/plot and, for collective use, a composting area (120 m²), 6 tool houses, 40 water taps, rest and snack areas and sanitary equipment. The prerequisite to apply for a plot, in addition to being a permanent resident, was the attendance of a 15 h training course in organic farming. This study was based on 65 out of the 133 Devesa Park gardeners who cultivated family plots.

Tools

The study was based on the administration of a socio-demographic questionnaire and of the evaluation scales, *Bem-Estar Pessoal* (Pais-Ribeiro and Cummins 2008) and *Felicidade Subjetiva* (Pais-Ribeiro 2012), both validated for the Portuguese population and further on in this document referred to as the 'personal well-being scale' and the 'subjective happiness scale', respectively. The sociodemographic questionnaire was intended to characterize the gardeners according to their gender, age, marital status, educational level, professional activity, household composition, income, type of housing, parish of residence and



Figure 1. Integration of the urban organic AG with 1.1 ha (ellipse), in the Devesa Park, V. N. Famalicão, Portugal.

Source: Department of Urbanism of the City Council of V. N. Famalicão (2013).

professional activity. The questionnaire also included the periodicity of gardening.

The *Bem-Estar Pessoal* scale (Pais-Ribeiro and Cummins 2008) is equivalent to the Personal Well-being Index – Adult (PWI), which is a valid cross-cultural instrument developed by the International Well-being Group (IWG 2013), that evaluates a life satisfaction domain. The scale aims to assess SWB and is defined as an emotional and cognitive assessment that people make of their lives, often referred to as the ‘satisfaction with life in general’ or a measure of ‘life evaluation’ (Cummins and Nistico 2002). In addition, the homeostatic theory holds that each person has a point of stability of their own, and their perception of well-being falls within a normal value for themselves (Cummins 2003). This instrument assesses the PWI according to seven domains (PWI Version #2; IWG 2013): standard of living, personal health, achievements in life, personal relationships, personal safety, community connectedness and future security. For each domain, a Likert response scale is shown from ‘0’ (extremely dissatisfied) to ‘10’ (extremely satisfied), with a neutral intermediate position (Pais Ribeiro and Cummins 2008).

The *Felicidade Subjetiva* scale (Pais-Ribeiro 2012) was adapted for the Portuguese population based on the Subjective Happiness Scale (SHS), originally developed by Lyubomirsky and Lepper (1999). This scale considers happiness from the respondent’s own perspective. It is asked to them to make an

overall judgment of the extent to which they are happy or unhappy people. It evaluates the fact that happiness is also considered an indicator of SWB. This 4-item scale includes two items that ask respondents to characterize themselves using both absolute ratings and ratings relative to peers, while the other two items give a brief description of happy and unhappy individuals and ask respondents the extent to which each characterization describes them. The answer is given on a Likert scale with seven positions, anchored in two antagonistic statements that express the level of happiness. On this scale, the first question evaluates the personal happiness (‘In general I consider myself ...’) and varies between the value 1 ‘a person who is not very happy’ and the value 7 ‘a very happy person’. The second question (‘Compared to other people like me, I consider myself ...’) evaluates the perspective of personal happiness compared to others and varies between the value 1 ‘a less happy person’ and the value 7 ‘a happier person’. In the characterization of the personal perspective of optimism in relation to life (‘Some people are generally very happy. They enjoy life despite what is going on around them, getting the best of what is available’), the value 1 indicates that the respondent is not self-perceived in this characterization, ‘not at all’, and the value 7 indicates that this is their characterization, ‘in large part’. The same scale is used in the last question of the characterization of the personal perspective of pessimism in relation to life (‘Some people are usually

not very happy. Although they are not depressed, they never seem as happy as they could be. To what extent does this characterization describe yourself?), where the value 1 denotes a happier person and the value 7 a less happy person.

Procedure

The due permissions from the scales' authors and the Municipality of V.N. Famalicão were obtained and the application of the instruments was done in a group context, after an invitation from the Urban Allotment Garden office. The invitation was sent to 30 gardeners per session and six sessions were performed, resulting in 65 validated respondents. In the beginning of each session, participants were informed about the objectives and the procedure of the study, as well as the anonymity, confidentiality, and the unpaid and voluntary nature of their participation. All participants signed informed consent and completed self-administered questionnaires in a single assessment. Each session took approximately 90 min, and it was necessary to clarify several doubts regarding the individual filling of the instruments.

Statistical analysis of the results was performed with the SPSS program, v25 for Windows (SPSS, Chicago, IL, USA), and included correlations, the Pearson's chi-squared test for independence to determine whether there was a significant difference between the expected frequencies and the observed frequencies, in categories of sociodemographic variables, the periodicity of visits to the garden and the two referred evaluation scales items.

Results

Gardeners' characterization

The gardeners in this study lived in the urban areas of the council (90.8%) and 56.9% were male. Almost half of them were aged between 46 and 65 years (47.7%), 36.9% were 25–45 years and 15.4% were older than 65. They were mostly married (72%), with a high education level, between the 12th academic year and a higher degree (56.9%). Nearly half of them were active professionals (46.2%), 21.5% were unemployed and 32.3% were retired. About 47.8% of the respondents had a net monthly income between €500 and €1250, with 35.3% above and 16.9% below that range. They lived mostly in apartments (56%) or independent houses (26%) they owned.

The impact of gardening frequency

The periodicity of gardening ranged from a few days a week (47.7%), on a daily basis (41.5%) and once a week (10.8%). The gardeners' perception about

Table 1. Gardeners perception of the impact in their lives through gardening in the urban organic AG in the Devesa Park ($n = 65$).

Gardeners perception	Frequency	Percentage (%)
Healthy food produced by myself	31	23.7
Occupation that fills and relaxes	32	24.4
Practice of physical exercise	11	8.4
Increased care with healthy eating	12	9.2
Increased interaction with children and grandchildren	5	3.8
Fewer medical appointments	3	2.3
Increased environmental awareness	15	11.5
Change to organic food	13	9.9
Talk with more people	9	6.9

changes in their lives since the beginning of the allotment cultivation was the occupation of free time and relaxation, as well as the production of healthy foods (Table 1). There was also an increased environmental awareness, increased consumption of organic products, increased food care, physical exercise and interaction with others. Although less frequent, an increased interaction with children and grandchildren and fewer medical appointments were also noticed.

The periodicity of visits to the urban organic AG was highly dependent on the sociodemographic variables such as age, education, professional activity and monthly income (Table 2). The frequency of garden

Table 2. Relationship between the periodicity of visits to the urban organic AG in the Devesa Park and the sociodemographic variables age, education, professional activity and monthly income ($n = 65$).

	Every day (%)	Some days/week (%)	At least 1 day/week (%)
Age (years)			
25–35	5.7	22.8	53.4
36–45	13.7	21.9	32.1
46–55	18.7	22.4	14.6
56–65	30.9	16.4	0.0
> 65	30.9	16.4	0.0
<i>Pearson's chi-squared test</i>	<i>Value</i>	<i>Df</i>	<i>p</i>
	110.797a	8	0.000
Education			
No education	7.4	0.0	0.0
From 1 to 6 years	44.5	29.0	0.0
From 7 to 12 years	22.2	32.3	0.0
Higher education (undergraduates)	18.5	38.7	57.1
Master degree	7.4	0.0	42.9
<i>Pearson's chi-squared test</i>	<i>Value</i>	<i>Df</i>	<i>p</i>
	168.699	8	0.000
Professional activity			
Employed	22.2	58.1	85.7
Unemployed	25.9	19.3	14.3
Retired	51.9	22.6	0.0
<i>Pearson's chi-squared test</i>	<i>Value</i>	<i>Df</i>	<i>p</i>
	95.220a	4	0.000
Monthly income			
< €500	22.2	12.9	14.3
€500 to €750	40.7	16.1	0.0
€750 to €1.250	14.8	25.8	42.9
€1.250 to €1.750	18.5	25.8	14.3
>€1.750	3.7	19.4	28.6
<i>Pearson's chi-squared test</i>	<i>Value</i>	<i>Df</i>	<i>p</i>
	83.944	8	0.000

Table 3. Cross-sectional Pearson correlations of the professional activity and the gardener's perception of the impacts in their lives through gardening in the urban organic AG in the Devesa Park ($n = 65$).

	Employed (%)	Pearson correlat. (p)	Unemployed (%)	Pearson correlat. (p)	Retired (%)	Pearson correlat. (p)
Healthy food produced by myself	53.3	-.012 (.926)	16.7	.046 (.720)	30.0	.025 (.844)
Occupation that fills and relaxes	37.5	.125 (.322)	25.0	-.166 (.188)	37.5	-.089 (.480)
Practice of physical exercise	18.2	.259(*) (.037)	27.3	-.067 (.595)	54.5	-.200 (.110)
Increased care with healthy eating	25.0	.174 (.165)	16.7	-.001 (.996)	58.3	.253(*) (.042)
Increased interaction with children and grandchildren	20.0	.059 (.641)	40.0	-.193 (.124)	40.0	-.013 (.918)
Fewer medical appointments	0.0	.162 (.198)	33.3	-.147 (.243)	66.7	-.117 (.353)
Increased environmental awareness	33.3	.112 (.375)	26.7	-.157 (.211)	40.0	-.078 (.537)
Change to organic food	23.1	.163 (.194)	15.4	.018 (.889)	61.5	.304(*) (.014)
Talk with more people	11.1	.261(*) (.037)	22.2	-.061 (.630)	66.7	.293(*) (.019)

(*) $p \leq 0.05$

visits increased with respondents' age, lower level of academic education and lower incomes. The active professionals were associated with less frequent visits to the garden, compared to the retired and unemployed gardeners (Table 2).

The professional activity was also related to some changes perceived by the gardeners (Table 3). More than 50% of the employed respondents considered the production of healthier food the main benefit from gardening in the urban organic allotments, while the retired respondents considered the practice of physical exercise, the increased care with healthy eating, including the change to organic food, the fewer medical appointments and social interactions. The perception of 'talk with more people' was found to be significantly correlated not only with the retired gardeners but also with the employed ones. The 'practice of physical exercise' was correlated with the employed gardeners, whereas for the retired ones significant correlations were found with 'increased care with healthy eating' and 'change to organic food' (Table 3).

Evaluation scales

The overall mean value found for the degree of life satisfaction (PWI) was 74.5% (on a scale of 0–100%) with a standard deviation of 14.1%, a minimum value of 30.0% and a maximum value of 100.0%.

The analysis of the SHS (Table 4) revealed that the personal happiness, both self-evaluated and in comparison to others, as well as the evaluation of the personal perspective of optimism in relation to life resulted in average values above the neutral scale value of 4, where the value 7 meant 'a happier person'. In the last question of the characterization of the personal perspective of pessimism in relation to life, the mean value (3.26) was below the neutral scale

value of 4 and in this question, the pessimism was the highest value 7.

Comparison between both scales revealed a close relationship ($p < .01$) between the overall mean value of the PWI and the variables of the SHS (Table 5), implying a close link between the cognitive and the emotional assessment that people make of their lives.

Correlations

Correlations between the overall mean value of the PWI and the sociodemographic characteristics or the gardener's perception of the impacts in their lives through gardening were not significant. However, significant correlations were found between some of these impacts. It is worth noting that the change to organic food and the fewer medical appointments were both correlated with the practice of physical exercise, the healthier food and increased family interaction with children and grandchildren. Moreover, the change to organic food was also correlated with fewer medical appointments, increased environmental awareness and the consideration that gardening is an occupation that fills and relaxes (Table 6).

Correlations between the four variables of the SHS and the sociodemographic characteristics or with the gardener's perception of the impact in their lives through gardening also did not reveal significant values. However, in both variables, the personal perspective of happiness and the perspective of personal happiness compared to others were significantly dependent on the periodicity of the visits to the AG (Table 7). The gardeners who visited the garden more frequently considered themselves happier from a self-perspective and in comparison with peers.

Table 4. Descriptive statistics of the SHS ($n = 65$).

SHS	Scale values	Valid percentage (%)	Mean	Minimum	Maximum	SD
Personal happiness	1	0.0	5.65	2	7	1.037
	2	1.5				
	3	0.0				
	4	9.2				
	5	33.8				
	6	32.3				
	7	23.1				
Perspective of personal happiness compared to others	1	0.0	5.62	2	7	0.995
	2	1.5				
	3	0.0				
	4	10.8				
	5	27.7				
	6	43.1				
	7	16.9				
Personal perspective of optimism in relation to life	1	0.0	5.31	2	7	1.249
	2	1.5				
	3	9.2				
	4	10.8				
	5	32.3				
	6	27.7				
	7	18.5				
Personal perspective of pessimism in relation to life	1	23.1	3.26	1	7	1.752
	2	13.8				
	3	18.5				
	4	18.5				
	5	12.3				
	6	12.3				
	7	1.5				

Table 5. Relationship between the overall mean value of the PWI and the variables of the SHS.

SHS	PWI
Personal happiness	Pearson correlation p
	.578(**) .000
Perspective of personal happiness compared to others	Pearson correlation p
	.366(**) .003
Personal perspective of optimism in relation to life	Pearson correlation p
	.329(**) .008
Personal perspective of pessimism in relation to life	Pearson correlation p
	-.372(**) .002

(**) $p \leq 0.01$ **Table 6.** Correlations between the overall mean value of the Personal Well-being Index (PWI) and the gardener's perception of the impact in their lives through gardening in the urban organic AG in the Devesa Park. A: healthy food produced by myself; B: occupation that fills and relaxes; C: practice of physical exercise; D: increased care with healthy eating; E: increased interaction with children and grandchildren; F: fewer medical appointments; G: increased environmental awareness; H: change to organic food; I: talk with more people ($n = 65$).

	PWI	A	B	C	D	E	F	G	H	I	
PWI	Pearson correlation p	1 .234	-.152 .139	-.185 .239	.148 .761	-.039 .290	.133 .706	.048 .317	.126 .990	-.002 .572	-.072 .572
A	Pearson correlation p	1 .032	.270(*) .465	.094 .002	.384(**) .002	.298(*) .018	.227 .073	.270(*) .032	.204 .108	.385(**) .002	.385(**) .002
B	Pearson correlation p		1 .302	.130 .001	.404(**) .001	.293(*) .018	.077 .544	.191 .127	.277(*) .026	.237 .059	.237 .059
C	Pearson correlation p			1 .000	.526(**) .000	.332(**) .007	.292(*) .018	.337(**) .006	.390(**) .001	.531(**) .000	.531(**) .000
D	Pearson correlation p				1 .000	.607(**) .000	.462(**) .000	.681(**) .000	.654(**) .000	.727(**) .000	.727(**) .000
E	Pearson correlation p					1 .000	.487(**) .000	.527(**) .000	.577(**) .000	.552(**) .000	.552(**) .000
F	Pearson correlation p						1 .001	.402(**) .001	.257(*) .039	.548(**) .000	.548(**) .000
G	Pearson correlation p							1 .000	.456(**) .000	.625(**) .000	.625(**) .000
H	Pearson correlation p								1 .000	.578(**) .000	.578(**) .000
I	Pearson correlation p									1 .000	.578(**) .000

(*) $p \leq 0.05$; (**) $p \leq 0.01$

Table 7. Pearson's chi-squared test for independence between the frequency of the visit to the urban organic AG and the gardeners' personal perspective of happiness ($n = 65$).

	Frequency of the visit to the urban organic AG		
	Every day (%)	Some days/week (%)	At least 1 day/week (%)
Personal perspective of happiness			
1	0.0	0.0	0.0
2	0.0	0.0	14.3
3	0.0	0.0	0.0
4 (neutral)	3.7	12.9	14.3
5	33.3	32.3	42.9
6	29.6	38.7	14.3
7 (a very happy person)	33.3	16.1	14.3
Pearson's chi-squared test	Value	Df	p
	123.313 ^a	12	0.000
Perspective of personal happiness compared to others			
1	0.0	0.0	0.0
2	0.0	0.0	14.3
3	0.0	0.0	0.0
4 (neutral)	7.4	16.1	0.0
5	22.2	29.0	42.9
6	44.4	41.9	42.9
7 (a very happy person)	25.9	12.9	0.0
Pearson's chi-squared test	Value	Df	p
	105.785 ^a	12	0.000

Discussion

Benefits perceived by the gardeners

Of the various benefits perceived by the gardeners of the urban organic AG in the Devesa Park, the occupation of free time and relaxation and the production of healthy food by themselves stand out. These two benefits, pointed out by almost half of the gardeners who participated in this study, could be linked with well-being, pleasure of growing their own food and promotion of healthy eating, which has also been highlighted in several studies (Dunnet and Quasim 2000; Catanzaro and Ekanem 2004; Stigsdotter and Grahn 2004; Draper and Freedman 2010; van den Berg and Clustre 2011; Partalidou and Anthopoulou 2017). Also, relaxation could be strengthened by the integration of the AG in the public Devesa Park, increasing the interaction with nature. It is widely recognized that this interaction brings beneficial effects on health and well-being (e.g. Dunnett and Quasim 2000; Twiss et al. 2003; Catanzaro and Ekanem 2004; Berto 2007).

Socialization was perceived as a benefit for both retired and employed gardeners, likewise in different contexts studies, for example in Europe (Davies et al. 2014), the United States (Twiss et al. 2003; Draper and Freedman 2010) or Australia (Kingsley et al. 2009). An increase in positive emotions by increased socialization can be expected as they seem to be influenced by social relationships (Tay and Diener 2011).

The practice of physical exercise associated with gardening and walking inside the Devesa Park to

access the AG, at least for the employed gardeners, could have a higher effect on the reduction of some factors such as stress, compared to physical activity practiced indoors, as shown by Hawkins and colleagues (2011).

The gardeners visited the AG in the Devesa Park on a daily basis or a few days a week and the periodicity of the visits increased with respondents' age. Bhatti and Church (2004) suggested that there are many psycho-social and health benefits for elder people when they carry out gardening.

Organic food consumption and production

The significant correlations between gardener's perception of the impacts in their lives through gardening were logical in the sense that 'change to organic food' and the 'fewer medical appointments' were both positively correlated with the items such as 'practice of physical exercise', 'healthy food produced by myself' and 'increased interaction with children and grandchildren'. Also, the 'change to organic food' was positively correlated with 'fewer medical appointments', 'increased environmental awareness' and the consideration that gardening is an 'occupation that fills and relaxes'. The meanings of these relationships are being widely discussed and corroborated, for example, in FAO (2007).

The 'healthy food produced by myself' together with the 'increased care with healthy eating' and the 'change to organic food' was significantly more perceived by the retired gardeners. Draper and Freedman (2010) also concluded that nutritional improvements in food were one of the benefits most recognized by urban gardeners in community gardening in the United States. On the other hand, there is a growing interest worldwide in adoption and expansion of the organic production system (FAO 2007; Smith et al. 2017b), as it is considered to be one of the less harmful agricultural systems both for the environment and the human health. In a study conducted by Smith et al. (2017a), organic agriculture provided a validated benchmark for defining and establishing sustainable agriculture principles, criteria and indicators, based on that it supports and facilitates resilient social, economic and environmental sustainability in rural and urban contexts.

The organic certification in the urban AG is indispensable for marketing the organic crops. The certification can be acquired by the individual control of each allotment, at the expenses of the respective gardener, or by the institution that manages the urban garden. However, the organic production in the Devesa Park is not certified because under its regulations it is forbidden to sell its crops. Nevertheless, the control is carried out through the presence of a permanent gardener with training in organic agriculture, who is responsible for the inspection of the allotments and provides technical

support and maintenance of the common areas. Gardeners can also ask for a technical advice via email to an expert qualified with an MSc in organic agriculture, who also provides regular specific meetings and workshops. If there is any non-compliance of the established rules for organic production, the gardener loses his allotment.

We consider that the organic production system implemented since the beginning was a key issue. For example, in France, the so-called 'Écophyto 2018 plan', aiming to reduce the use of pesticides by 50% in agriculture and amateur gardening, faced some difficulties to be implemented. A study conducted by Farges (2015) reported that French urban gardeners implemented some ecological gardening practices, whatever their social characteristics, but resilience was encountered.

The training course in organic farming that gardeners attended in this study was also key not only to ensure organic vegetable production practices, but also to account for the ecological literacy of the gardeners, through the introduction and consolidation of concepts such as agroecosystems, composting, biodiversity, biological control and others. Higher ecological literacy leads to improvements in ecological knowledge and understanding of the urban citizens, which is positively related to the concept of sustainability (Pitman et al. 2017) and to the General Union Environment Action Programme to 2020 'Living well, within the limits of our planet' (EU 2013).

Life satisfaction (Personal Well-being Index, PWI)

Life satisfaction among gardeners of the urban organic allotments in the Devesa Park (PWI = 74.5%) was higher than the average value for the Portuguese population (68.92%), and in the range of the satisfaction with life, from 60% to 80%, obtained in the 44 countries considered in the study of Pais-Ribeiro and Cummins (2008). The positive evaluation of gardening by the respondents may partly explain the high level of life satisfaction, a result also mentioned by Waliczek and colleagues (2005). However, it should be noted that the sample of the present study included 45% of people with active professional activity and with a balanced situation at the family, social and economic levels. From this group, we expected a positive satisfaction with life, namely due to satisfaction with the standard of living, personal health, achievements in life, personal relationships, personal safety, community connectedness and future security (Diener and Tay 2015).

Subjective happiness scale (SHS)

While the satisfaction with life scale can assess the cognitive component of SWB, the SHS is a global, subjective assessment of whether one is a happy or

an unhappy person. This would reflect a wider concept of well-being and better explore the global psychological phenomena (Diener 1994). The subjective happiness is a variable that has gathered increasing interest as it is believed to play a crucial role in well-being and overall happiness (Karakasidou et al. 2016). Results on all the issues of the SHS revealed that there is a positive happiness perceived by the gardeners of the Devesa Park, which in their great majority self-evaluate as being happy with themselves and in comparison with others, also having an optimistic and positive outlook on life. This positivity and perception of personal and comparative happiness can, on the whole, be explained by proximity to nature and plant cultivation, but also by socialization in the community space. It can also be explained by the personal feeling of happiness in the direct work in the garden, when harvesting their own food, or by the feeling of personal relaxation that it can provide. As for the perception of personal happiness compared to others, there was also a positive trend that could be associated with the fact that the urban organic AG has restricted access, conferring a kind of privileged status for those who use it. In that sense, when one compares himself/herself with others, he/she may feel privileged and happy for the opportunity and the related gardening benefits he/she can enjoy (Partalidou and Anthopoulou 2017).

The values of the subjective happiness scale increased with the regularity of visiting the urban AG, showing that people are happier with themselves when they go to the garden frequently. This has been validated in similar studies, in which the perception of regular work in the gardens directly influenced personal happiness and the relationship with others, through factors such as creativity and personal expression (Dunnnett and Quasim 2000), the sensation of relaxation (Stigsdotter and Grahn 2004), self-esteem and self-confidence (Sempik et al. 2003), personal valuation (Kingsley et al. 2009) and positive humour (van den Berg and Cluster 2011).

Subjective well-being (SWB)

SWB referring to the different forms of evaluating one's life or emotional experience, such as satisfaction, positive affect and low negative affect (Diener et al. 2017a), can be evaluated by the instruments used in this study (PWI and SHS).

The correlations between the sociodemographic characteristics and the mean PWI value as well as the four variables of the SHS were not significant, suggesting that the sociodemographic variables used in the study did not explain the variability of SWB. This is in accordance with Lyubomirsky (2001), who stated that individual characteristics can explain only 8% to 15% of the variance in happiness. This showed

that much of the variation in happiness may come from factors other than sociodemographic, although they play a small role in building individual well-being. For example, Knabe et al. (2010) reported that unemployed persons were significantly less satisfied with their lives than employed persons, but they did not differ in their daily affective well-being, which refers to the feelings of happiness and the absence of unpleasant affect. However, high unemployment can severely lower the well-being of individuals and also affect other societal members (Tay and Kuykendall 2013).

Taking into account that sufficient detachment and recovery during a leisure activity is attained, many studies have shown that SWB was positively correlated with different aspects of leisure, such as visiting family and friends, playing sports or games, watching television, traveling, creating art and using the Internet (e.g. Koopman-Boyden and Reid 2009; Kleiber et al. 2011), as this is a critical component of life satisfaction (Newman et al. 2014). Here, it is suggested that SWB was positively correlated with gardening, showing that community gardening is a promising method of improving well-being and the resilience of individuals, of the communities and of the natural environment (e.g. Okvat and Zautra 2011). The growing movement towards community-driven urban development, such as the urban AG, is rich in physical, psychological and relational resources (Poulsen et al. 2014) and also matches the recommendations that measures beyond economic ones are needed to capture the well-being of societies (Stiglitz et al. 2009).

According to Lyubomirsky et al. (2005), some primary characteristics of happy people are as follows: 'confidence, optimism, self-efficacy, positive construal of others, sociability, immunity and physical health, effective coping with life's stressors, authenticity, and flexibility'. Although there is little understanding of why happy people might exhibit more desirable behaviours, happy individuals tend to be successful and accomplish across multiple life domains (Lyubomirsky et al. 2005). It has been suggested that high SWB leads to a number of beneficial outcomes, including health and longevity, supportive social relationships, work productivity and citizenship, and that SWB not only correlates with such beneficial outcomes, but also causes them (Lyubomirsky et al. 2005; Whelan and Zelenski 2012; Diener et al. 2015, 2017b). These suggest that high levels of SWB should be beneficial for society (NDP 2013).

Further work

Further work should continue to examine aspects of interventions (e.g. technical advice, training and shared facilities management) that enable continued

practice, contributing to sustain initial gains in SWB. Future work might also examine the influence of these intervention strategies on a broad range of aspects of life that have been shown to follow from SWB (Diener et al. 2017a). For example, does gardening in the urban allotments have downstream effects on health, relationships, prosocial behaviours and cognitive outcomes such as creativity, in an attempt to better understand their relationships with SWB (Diener et al. 2017a). More than economic growth, accounts of SWB are a useful way to assess citizen's evaluations of overall progress in the quality of life in their societies (Diener and Tay 2015).

Conclusion

This research highlighted the most relevant perceived benefits of the use of the urban organic AG in the Devesa Park, mainly the occupation of free time and relaxation and the production of healthy foods. Increased environmental awareness, change in eating habits, increased physical exercise, socialization and interaction with others were also pointed out by the gardeners.

The main hypothesis was confirmed with the significant correlations between the SWB and gardening. Gardeners consider themselves happy with their life and revealed an optimistic and positive attitude with life, regardless of their economic or social difficulties. The increased frequency of visits for gardening was positively related to a greater perception of subjective happiness. The gardeners who visit the garden more frequently consider themselves happier from a self-perspective and in comparison with peers. This agrees with the suggestion that happiness improvements come from simple cognitive and behavioural strategies in daily lives.

Urban organic AG enhance well-being of the citizens, contributing positively to their feelings of happiness and life satisfaction, changing behaviours and developing personal capacities. Therefore, urban allotments can be considered one of the recommended measures beyond economic ones that are needed to capture the well-being of societies. They should be implemented not only for ordinary citizens but also for social and therapeutic horticulture purposes, through gardening programs intended for the elderly, disabled or health-care dependents, psychosocial rehabilitation or social inclusion. For ecological and public health reasons, the urban AG should always be managed according to organic regulatory guidelines, for which it is crucial to provide training and technical information to gardeners. Similarly, it is essential to keep a permanent gardener for site maintenance, able to provide technical advice and to supervise the gardeners' agricultural practices.

Disclosure statement

No potential conflict of interest was reported by the authors.

ORCID

I. Mourão  <http://orcid.org/0000-0003-4890-6584>
 T. C. Almeida  <http://orcid.org/0000-0002-3354-7809>
 L. M. Brito  <http://orcid.org/0000-0002-6606-2963>

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