Mental Health Benefits of Long-Term Exposure to Residential Green and Blue Spaces: A Systematic Review

Table S1. Additional characteristics and quality scores of the studies included in	Page S2
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and categories given to each study	

Author (Year, Country)	Study Design/Population (N)	Statistical Methods	Co-Variables of Adjustment and Interactions Evaluated	Other Information
Alcock <i>et al.</i> 2014, The UK [1]	Longitudinal Adults (N = 1064)	Fixed effects regression	 ✓ CAU level: income, employment and education deprivation and crime rate index ✓ Individual level: age, education, marital status, living with children, household income, work-limiting illness, labour market status, residence type and commuting time 	 ✓ It does not evaluate quality or use of GS ✓ Participants have been living at least 1 year in the studied residence ✓ Restricted to urban areas from England ✓ Risk of lost-to-follow up of those with worse mental health ✓ Gardens included
Amoly 2014 et al., Spain [2]	Cross-sectional Children 7–10 y (N = 2111)	Quasi-Poisson mixed effects model	 ✓ CAU level: socioeconomic status ✓ Individual level: gender, school level, ethnicity, preterm birth, breastfeeding, exposure to environmental tobacco smoke, maternal smoking during pregnancy, responding person, parental education, employment and marital status 	 ✓ It does not evaluate quality of GS ✓ It takes into account use of GS ✓ No mention of the minimal time of residence ✓ School greenness evaluated ✓ Restricted to urban areas
Annerstedt <i>et al.</i> 2012, Sweden [3]	Longitudinal Adults 18–80 y (N = 9230)	Logistic regression	 ✓ Mental health of the first follow-up, age, financial stress, cohabitation status, country of origin ✓ Interaction with physical activity 	 ✓ It evaluates quality of GS ✓ Exclusion of people who changed residence ✓ Individuals living in larger city centres excluded ✓ Responders slightly higher education ✓ Lost-to-follow up of those with worse mental health
Araya <i>et al.</i> 2007, Chile [4]	Cross-sectional Adults 16–64 y (N = 3870)	Multilevel linear/logistic regression	 CAU level: episodes of violent crime reported to local police and general quality, facilities, and empty sites of the CAU Individual level: age, gender, presence of disease, income, education, marital status, housing type, number of supportive individuals, alcohol use 	 Exposure includes presence of public green areas and its state by creating a factor that includes both It does not evaluate use of GS No mention of the minimal time of residence Socially deprived individuals less likely to participate GS evaluated 4y after mental health assessment

Table S1. Additional characteristics of the studie	s included in the systematic rev	view on green and blue spac	es and mental health.
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Author (Year, Country)	Study Design/Population (N)	Statistical Methods	Co-Variables of Adjustment and Interactions Evaluated	Other Information		
Astell-Burt <i>et al.</i> 2013, Australia [5]	Cross-sectional >45 y $(N = 260,061)$	Multilevel logit regression	 ✓ CAU level: socioeconomic index of the studied areas, urban vs remote areas ✓ Individual level: social interactions, age, gender, ancestry, country of birth, language spoken at home, household income, education, economic status, couple status, smoking, alcohol consumption, BMI ✓ Interaction with physical activity 	 ✓ It does not evaluate quality of GS ✓ No mention of the minimal time of residence ✓ Agriculture land and private gardens excluded 		
Astell-Burt <i>et al.</i> 2014, The UK [6]	Longitudinal >15 y (N = 65,407)	Multilevel linear regression	 ✓ Age, gender, employment status, household tenure, marital status, education, marital status, smoking, household income ✓ Interaction with age and gender 	 ✓ It does not evaluate quality or use of GS ✓ Participants have been living at least 1 year in the studied residence ✓ GS change over time taken into account ✓ Only people living in urban neighbourhoods ✓ Private gardens excluded 		
Balseviciene <i>et al.</i> 2014, Lithuania [7]	Cross-sectional Children 4–6 y (N = 1468)	Non-hierarchical linear regression	✓ Age, gender, parenting stress✓ Interaction with maternal education	 ✓ It does not evaluate quality or use of GS ✓ No mention of the minimal time of residence ✓ Only children from urban areas 		
Beyer et al. 2014, The USA [8]	Cross-sectional 21–74 y (<i>N</i> = 2479)	Linear regression	 CAU level: urbanicity, unemployment, instability, poverty, population density, education, housing tenure, % Afro-American, household income. Individual level: age, gender, ethnicity, education, income, marital status and insurance status, length of residence in the neighbourhood 	 ✓ It does not evaluate quality or use of GS ✓ No mention of the minimal time of residence 		
De Vries <i>et al.</i> 2003, The Netherlands [9]	Cross-sectional All ages ($N = 10,197$)	Logistic multilevel analysis	 ✓ CAU level: urbanity ✓ Individual level: age, gender, education, number of rooms, type of health insurance, number of life-events ✓ Interaction with education and urbanity degree 	 ✓ It does not evaluate quality or use of GS ✓ Participants have been living at least 1 year in the studied residence ✓ Exclusion of those with changes in urbanity in their neighbourhood ✓ GS and health data collected at different moments 		

Table S1. Cont.

Author (Year, Country) Study Design/Population (N) Statistical Methods		Statistical Methods	Co-Variables of Adjustment and Interactions Evaluated	Other Information			
De Vries <i>et al.</i> 2013, The Netherlands [10]	Cross-sectional All ages (N = 1641)	Multilevel analysis	 ✓ Individual level: gender, age, education, income, life events, children at home, smoking, excessive drinker ✓ Mediation of stress, social cohesion and green and physical activity 	 ✓ Evaluates quality of GS ✓ Partially evaluates use of GS ✓ No mention of the minimal time of residence ✓ Neighbourhoods with peculiar or extreme socioeconomic profiles excluded 			
Duncan <i>et al.</i> 2013, The USA [11]	Cross-sectional Adolescents ~ 16 y ($N = 1170$)	Ordinary least squares regression	 ✓ CAU level: school, % Black & Hispanics, households below poverty, % born outside the buffer ✓ Individual level: race/ethnicity, gender, age, nativity, family structure ✓ Interaction with gender and ethnicity 	 ✓ It does not evaluate quality or use of GS ✓ No mention of the minimal time of residence 			
Fan <i>et al.</i> 2011, The USA [12]	Cross-sectional Adults 18–75 y (N = 1544)	Linear regression	✓ Individual level: gender, age, ethnicity, education, household income, employment status, marital status, number of children, physical activity, social support	 ✓ It does not evaluate quality or use of GS ✓ No mention of the minimal time of residence ✓ Years that participants have been living in the area 			
Flouri <i>et al.</i> 2014, The UK [13]	Longitudinal Children 3 & 7 y (N = 6384)	Mixed model	 ✓ CAU level: deprivation ✓ Individual level: age, gender, ethnicity, socio-economic status, adverse life events, maternal education, marital status parents, garden access ✓ Interaction with socioeconomic status 	 ✓ It does not evaluate quality of GS ✓ No mention of the minimal time of residence ✓ Exclusion of private gardens ✓ Rural areas excluded 			
Francis <i>et al.</i> 2012, Australia [14]	Cross-sectional Adults 20–79 y (N = 911)	Logistic regression	 ✓ CAU level: crime (self-reported), socioeconomic status ✓ Individual level: gender, age, marital status, children at home, education, work status, hours worked, BMI, life events, participation in social groups, social network and support, sense of community 	 ✓ Evaluates quality and use of GS ✓ Participants have been living at least 1 year in the studied residence 			
Maas <i>et al.</i> 2009, The Netherlands [15]	Cross-sectional 12 to >65 y (N = 4842–10,089)	Multilevel logistic regression	 ✓ CAU level: urbanicity ✓ Individual level: age, gender, household size, education, household income ✓ Mediation analyses with social support 	 ✓ It does not evaluate quality or use of GS ✓ No mention of the minimal time of residence ✓ Gardens and small GS excluded 			
Maas <i>et al.</i> 2009, The Netherlands [16]	Cross-sectional All ages ($N =$ 345,143)	Multilevel logistic regression	 ✓ CAU level: urbanicity ✓ Individual level: age, gender, education, health insurance, work situation ✓ Interaction with age, socioeconomic status, urbanicity 	 ✓ It does not evaluate quality or use of GS ✓ Participants have been living at least 1 year in the studied residence ✓ Small GS excluded if not predominant 			

Table S1. Cont.

Author (Year, Country)	Study Design/Population (N)	Statistical Methods	Co-Variables of Adjustment and Interactions Evaluated	Other Information
Markevych <i>et al.</i> 2014, Germany [17]	Cross-sectional $10 \text{ y} (N = 1932)$	Logistic regression	 ✓ Individual level: age, gender, parental education, maternal age at birth, civil status, time in front of a screen, time spent outdoors ✓ Interaction with gender and urbanicity ✓ Mediation analysis: physical activity 	 ✓ It does not evaluate quality or use of GS ✓ Sensitivity analyses excluding GS >5000m² ✓ Participants have been living at least 1 year in the studied residence
Nutsford <i>et al.</i> 2013, New Zealand [18]	Ecological >15 y (<i>N</i> = 319,521)	Negative binomial regression	✓ CAU level: deprivation levels (derived from nine variables)	 ✓ It does not evaluate quality or use of GS ✓ No mention of the minimal time of residence
Reklaitiene <i>et al.</i> 2014, Lithuania [19]	Cross-sectional $45-72 \text{ y} (N = 7161)$	Logistic regression	 ✓ Individual level: age, marital status, education, smoking, use of alcohol, BMI ✓ Interaction with age, gender, park use 	 ✓ It does not evaluate quality of GS ✓ Evaluates use of GS ✓ No mention of the minimal time of residence
Richardson <i>et al.</i> 2013, New Zealand [20]	Cross-sectional >15 y ($N = 8157$)	Multilevel logistic regression	 ✓ Individual level: gender, age, smoking, index of socio-economic deprivation ✓ Interaction with physical activity 	 ✓ It does not evaluate quality or use of GS ✓ No mention of the minimal time of residence ✓ Rural areas excluded
Roe <i>et al.</i> 2013, The UK [21]	Cross-sectional $33-55 \text{ y} (N = \sim 100)$	Linear regression	\checkmark Individual level: age, gender, deprivation level, access to gardens	 It does not evaluate quality or use of GS Participants have been living at least 1 year in the studied residence Non-working adults from socio-economically deprived areas Private gardens excluded
Sarkar <i>et al.</i> 2013, The UK [22]	Cross-sectional $65-84 \text{ y} (N = 687)$	Multilevel logistic regression	 ✓ CAU level: deprivation ✓ Individual level: age, alcohol consumption, social class, education, chronic vascular comorbidities 	 ✓ Partial evaluation of quality of GS ✓ It does not evaluate use of GS ✓ No mention of the minimal time of residence
Sturm <i>et al.</i> 2014, The USA [23]	Cross-sectional Adults ($N = 1070$)	Hierarchical linear regression	 ✓ Individual level: age, gender, BMI, overall health status, unemployment ✓ Mediation analysis: physical activity, park frequency 	 ✓ It does not evaluate quality of GS ✓ Evaluates use of GS ✓ No mention of the minimal time of residence ✓ Seasonal effects and regional unemployment rates assessed

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Author (Year, Country)	Study Design/Population (N)	Statistical Methods	Co-Variables of Adjustment and Interactions Evaluated	Other Information
Triguero-Mas <i>et al.</i> 2015, Spain [24]	Cross-sectional $34-64 \text{ y}$ ($N = 8793$)	Logistic regressions	 ✓ Individual level: gender, age, education level, birth place, type of health insurance, marital status, and indicators of household and neighbourhood socioeconomic status. Degree of urbanization as an effect modifier. ✓ Mediation analysis: social support, physical activity 	 ✓ It does not evaluate quality of GS ✓ It does not evaluate use of GS ✓ No mention of the minimal time of residence
Van den Berg <i>et al.</i> 2010, The Netherlands[25]	Cross-sectional >18 y ($N = 4529$)	Multilevel linear regression	 ✓ CAU level: level of urbanity ✓ Individual level: age, gender, education, income ✓ Interaction with physical activity stressful life events 	 It does not evaluate quality or use of GS Participants have been living at least 1 year in the studied residence Interviews performed across the four seasons Small GS excluded
Weich <i>et al.</i> 2002, The UK [26]	Cross-sectional Adults >16 y (N = 1896)	Linear and logistic regression	✓ Individual level: age, gender, marital status, employment status, education, housing tenure, car access, ethnicity	 ✓ It does not evaluate quality or use of GS ✓ Only number of trees or private gardens evaluated ✓ Years that participants have been living in the area
White <i>et al.</i> 2013, The UK [27]	Longitudinal Adults ($N = 12,818$)	Fixed-effects regression	 ✓ CAU level: income, employment, education, crime ✓ Individual level: age, education, marital status, living with children, work-limiting health status, labourmarket status, residence type, household space, commute length 	 It does not evaluate quality or use of GS Participants have been living at least 1 year in the studied residence Only urban areas included Gardens included
White <i>et al.</i> 2013, The UK [28]	Longitudinal Adults (<i>N</i> = 15,361)	Fixed-effects regression	✓ Individual level: age, education, marital status, living with children, work-limiting health status, labourmarket status, residence type, household space, commute length, green space	✓ It does not evaluate quality or use of blue spaces

CAU level: Census area unit level, GS: green space, BMI: body mass index.

Table S2. Criteria for q	uality assessment	of the studies.
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0 = ecological, 1 = cross-sectional, 2 = longitudinal				
0 = no confounding factors considered, $1 =$ confounding factors considered but some key confounders omitted, $2 =$ careful				
consideration of confounders				
0 = flaws in or inappropriate statistical testing or interpretation of statistical tests that may have affected results, $1 =$ appropriate				
statistical testing and interpretation of tests				
0 = other study design or conduct issues that may have led to bias, $1 =$ no other serious study flaws				
0 = exposure of interest one of the many variables being tested, $1 =$ exposure of interest the main variable tested				
0 = self-reported questionnaires, $1 =$ interviews conducted by experts or clinical records or other objective measures (biomarkers				
such as cortisol) that support the results of the mental health tests conducted				
0 = expert assessment (audit), $1 =$ satellite system or land-cover map				
0 = not measured and/or not included in the analysis, 1=measured and included in the analysis				
0 - no. 1 - was hut nortially 2 - was and many and with an appagament to al				
0 - 10, $1 - yes, but partially, 2 - yes, and measured with an assessment tool$				
0 = incomplete information, 1 = complete information (estimate and standard error or confidence interval).				
0 = no or not clearly specified 1= yes				
0 = no or not clearly specified, 1= yes				

	Study Design	Confounding Factors	Statistics	Potential Bias	Multiplicity	Outcome Assessment	GS/BS Assessment	Use of GS/BS	Quality of GS/BS	Effect Size	At least 1y Living in the Area	Score (Absolute Number)ª	Score (%)ª	Quality Category
Alcock <i>et al.</i> 2014, The UK [1]	2	2	1	0	1	0	1	0	0	1	1	9	64	Good
Amoly 2014 et al., Spain [2]	1	2	1	0	0	0	1	1	0	1	0	7	50	Fair
Annerstedt <i>et al.</i> 2012, Sweden [3]	2	1	1	0	0	0	0	0	NAª	0	1	5	42	Fair
Araya <i>et al.</i> 2007, Chile [4]	1	2	1	0	1	1	0	0	0	1	0	7	50	Fair
Astell-Burt <i>et al.</i> 2013, Australia [5]	1	2	1	1	1	0	1	0	0	1	0	8	57	Fair
Astell-Burt <i>et al.</i> 2014, The UK [6]	2	2	1	1	1	0	1	0	0	1	1	10	71	Good
Balseviciene <i>et al.</i> 2014, Lithuania [7]	1	1	1	1	1	0	1	0	0	0	0	6	43	Fair
Beyer et al.2014, The USA [8]	1	2	1	0	1	0	1	0	0	1	0	7	50	Fair
De Vries <i>et al.</i> 2003, The Netherlands [9]	1	2	1	0	0	0	1	0	0	0	1	6	43	Fair
De Vries <i>et al.</i> 2013, The Netherlands [10]	1	2	0	0	1	0	0	0	NAª	1	0	5	42	Fair
Duncan <i>et al.</i> 2013, The USA [11]	1	1	0	1	0	0	1	0	0	1	0	5	36	Poor
Fan <i>et al.</i> 2011, The USA [12]	1	2	1	0	0	0	1	0	0	0	0	5	36	Poor

Table S3. Cont.

	Study Design	Confounding Factors	Statistics	Potential Bias	Multiplicity	Outcome Assessment	GS/BS Assessment	Use of GS/BS	Quality of GS/BS	Effect Size	Living in the Area	(Absolute Number) ^a	Score (%) ^a	Quality Category
Flouri <i>et al.</i> 2014, The UK [13]	2	2	1	0	1	0	1	0	0	1	0	8	57	Fair
Francis <i>et al</i> . 2012, Australia [14]	1	2	1	1	0	0	1	0	2	0	1	9	64	Good
Maas <i>et al.</i> 2009, The Netherlands [15]	1	2	1	1	1	0	1	0	0	0	1	8	57	Fair
Maas <i>et al.</i> 2009, The Netherlands [16]	1	2	1	1	1	1	1	0	0	1	1	10	71	Good
Markevych <i>et al.</i> 2014, Germany [17]	1	2	1	0	1	0	1	0	0	1	1	8	57	Fair
Nutsford <i>et al.</i> 2013, New Zealand [18]	0	1	1	1	0	1	1	0	0	1	0	6	43	Fair
Reklaitiene <i>et al.</i> 2014, Lithuania [19]	1	1	1	1	1	0	1	1	0	1	0	8	57	Fair
Richardson <i>et al.</i> 2013, New Zealand [20]	1	1	1	1	1	0	1	0	0	1	0	7	50	Fair
Roe <i>et al.</i> 2013, The UK [21]	1	1	1	0	0	1	1	0	0	1	1	7	50	Fair
Sarkar <i>et al.</i> 2013, The UK [22]	1	2	1	1	0	0	1	0	1	0	0	7	50	Fair
Sturm <i>et al.</i> 2014, The USA [23]	1	1	1	0	1	0	0	1	0	1	0	6	43	Fair
Triguero-Mas <i>et al.</i> 2015, Spain [24]	1	2	1	1	0	0	1	0	0	1	0	7	50	Fair

	Study Design	Confounding Factors	Statistics	Potential Bias	Multiplicity	Outcome Assessment	GS/BS Assessment	Use of GS/BS	Quality of GS/BS	Effect Size	At least 1y Living in the Area	Score (Absolute Number)ª	Score (%) ^a	Quality Category
Van den Berg <i>et al.</i> 2010, The Netherlands [25]	1	1	1	1	1	0	1	0	0	0	1	7	50	Fair
Weich <i>et al.</i> 2002, The UK [26]	1	1	1	1	0	0	0	0	0	1	1	6	43	Fair
White <i>et al.</i> 2013, The UK [27]	2	2	1	1	0	0	1	0	0	1	1	9	64	Good
White <i>et al.</i> 2013, The UK [28]	2	2	1	1	0	0	1	0	0	1	0	8	57	Fair

 Table S3. Cont.

GS/BS: green space or blue space (depending on the studied exposure in each study); ^aFor each study the total score was calculated by adding the scores on the 11 dimensions and expressing them as a percentage of the maximum score, which was 14, except for two studies [11,12] in which the inclusion of quality of green spaces as a confounder did not make sense as the main exposure of interest was the quality of green spaces (maximum score = 12). Afterwards, five categories were created to define the quality of each study: *excellent quality* (score \geq 81%), *good quality* (between 61 and 80%), *fair quality* (between 41 and 60%), *poor quality* (between 21 and 40%) and *very poor quality* (\leq 20%).

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