LANDSCAPE AND URBAN PLANNING

Indexes of perceived residential environment quality and neighbourhood attachment in urban environments: a confirmation study on the city of Rome

Marino Bonaiuto[*], Ferdinando Fornara, Mirilia Bonnes

*Dipartimento di Psicologia dei Processi di Sviluppo e Socializzazione, Università degli Studi di Roma "La Sapienza",
Via dei Marsi 78, 00185 Rome, Italy*

Abstract

This paper presents two instruments measuring the quality of the relationship that inhabitants have with their urban neighbourhoods. These instruments consist of 11 scales measuring the perceived environmental qualities of urban neighbourhoods and one scale measuring neighbourhood attachment.

The 11 scales are included in four generative criteria as follows: three scales concern spatial aspects (i.e. architectural-planning space, organization and accessibility of space, green space); one concerns human aspects (i.e. people and social relations); four concern functional aspects (i.e. welfare, recreational, commercial, transport services); three concern contextual aspects (i.e. pace of life, environmental health, upkeep).

The study objectives were: (a) to compare the structure and number of both indexes of perceived environmental quality and the neighbourhood attachment index with respect to the findings of a study (see [J. Environ. Psychol. 19 (1999) 331]) that used a previous version of these instruments; (b) to improve the psychometric qualities (i.e. internal consistency coefficients) of the used tools.

The instruments have the form of a self-reported questionnaire which was administered to 312 residents in seven neighbourhoods (differing in various features) of a great urban context like the city of Rome.

A series of Principal Component Analyses (PCA) was performed on the data.

Results confirm the factorial structure of the scales, which include 19 perceived quality indexes (150 items total) and one neighbourhood attachment index (eight items). The scales show an increased level of reliability with respect to earlier studies.
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1. Introduction

This paper concerns the relationship between inhabitants and their neighbourhood of residence in the urban environment. This is a typical research issue in Environmental Psychology (EP) (e.g. Tognoli, 1987; Lawrence, 2002) that has focused on the relationship between people and their residential environment on different levels (home, neighbourhood and city). The neighbourhood as an intermediate level of analysis was chosen for the following reasons: (1) it allows considering private and public structures and processes, while the "home" and "city" levels mainly consider the former and latter, respectively; (2) earlier studies

* Corresponding author. Tel.: +39-6-49917661;
fax: +39-6-49917652.
E-mail address: marino.bonaiuto@uniroma1.it (M. Bonaiuto).
URLs: Departmental web page: http://dip38.psi.uniroma1.it,
Personal web page: http://dip38.psi.uniroma1.it/persone/pagina.cgi?
info=bonaiuto.com

showed that it serves as a link between "home" and "city" levels in people's perceptions and actions regarding the residential environment (Bonaiuto and Bonnes, 1996).

Within the Theory of Place in EP (e.g. Canter, 1977), inhabitants' residential satisfaction (RS) has been defined as the experience of pleasure or gratification deriving from living in a specific place. From a conceptual standpoint, RS includes the three main components of the psychological construct of attitude (cognition, affection and behaviours; Rosenberg and Hovland, 1960).

For the cognitive component, the literature has a rich research tradition concerning residents' appraisal (distinct from expert/technical assessment) of both specific and general aspects of residential quality. The appraisal typically takes the form of perceived environmental quality indicators (e.g. Craik and Zube, 1976; Carp and Carp, 1982) that can be extensively used in town-planning. Some important research issues concern: (a) the relationship between experts' and layperson's environmental assessments; (b) the relation between more "molecular" (e.g. water and air quality) and more "molar" (e.g. the neighbourhood) indicators; (c) the use of these indicators in *Post-Occupancy Evaluation* procedures (Gifford, 2002).

For the affective component, EP literature mainly refers to two constructs, namely the affective qualities of places and place attachment. The first construct will not be treated in this paper, whereas the second is an important part of this study, specifically at neighbourhood level. Neighbourhood attachment is considered part of the more general place attachment concept (Giuliani, in press). Brown and Perkins (1992) defined place attachment as the positive affective, cognitive and behavioural bonds that people develop over time with their social and physical environment. Because of their relational and temporal salience, residential environments are the most important (and thus the most studied) place people may attach to in their lifetime. Studies on residential attachment operationalise it in terms of a general affective link between people and the overall aspects of their residence. It encompasses cognitive, motivational and behavioural aspects, reflected in psychological correlates such as the tendency to give favourable evaluations of their dwelling place, reasons for im-

proving it and their reluctance to leave it. These aspects may however, at least for the neighbourhood, be condensed into a one-dimensional concept, even when measured using theoretically multi-dimensional instruments (Bonaiuto et al., 1999).

Finally, EP literature on residential satisfaction has fewer studies concerning the behavioural component. Of these, those dealing specifically with residential neighbourhood try to extend Place Theory towards an inter- or multi-place perspective (Bonnes et al., 1990; Bonaiuto and Bonnes, 1996). Findings show how each specific system of multi-place activities may characterise specific social groups and categories defined according to residential and socio-demographic variables, and how these systems are associated with specific patterns of neighbourhood environmental quality perception. These patterns appear to be generally consistent with the main activities conducted, thus showing empirically how the cognitive and behavioural dimensions of neighbourhood evaluation and satisfaction may be interrelated.

From an operational standpoint, RS is conceived as a multi-dimensional concept (Francescato, 2002), measurable through item lists of various length. EP literature highlighted three main neighbourhood evaluative aspects (e.g. Canter, 1983; Amérigo, 2002): spatial (architectural and town-planning features), human (socio-relational features) and functional (services and facilities). Previous Italian studies confirmed the plausibility of distinguishing between these three aspects of neighbourhood perception in the urban environment (Bonnes et al., 1991), and also highlighted how they may interconnect.

Two main models have been proposed in RS literature (Amérigo, 2002). The first considers RS as a criterion variable and seeks to identify its most relevant predictors, in order to provide useful information for town-planning and management. Conversely, the second uses RS as a variable predicting other relevant urban behaviours, such as residential mobility or residential choice. Although RS has been theoretically defined as multi-dimensional, studies in this field have often used synthetic and single item indicators, typically through self-reported *paper*-and-*pencil* tools (Francescato, 2002).

The multi-dimensional nature of RS can, however, be derived by combining different constructs within explicative models, and by considering possible

relationships between broad sets of predictors and criteria (Bonaiuto et al., 1999).

The need for valid reliable tools for measuring these constructs, something stressed by various authors (e.g. Amérigo and Aragones, 1990), led to a long period of research and data accumulation to assess the factorial structure of two psychometric instruments used in urban contexts. The instruments respectively consist of a series of scales measuring Perceived Residential Environment Quality (PREQ) and a scale measuring neighbourhood attachment (NA).

The instruments have a modular structure to also separately administer the relative scales according to the environmental qualities the researchers are interested in (some examples are reported in Bonaiuto and Bonnes, 2002).

The initial version of PREQ scales was based on three generative criteria which reflect the three main evaluative aspects (spatial, human and functional) of neighbourhoods. Preliminary qualitative analyses showed a fourth distinct aspect, regarding context features (i.e. neighbourhood lifestyle, environmental health/pollution and upkeep/care), that was empirically confirmed (Bonnes et al., 1997).

The copious data gathered and the progressive refinement of the instruments resulted in the version used in Bonnes et al. (1997) and Bonaiuto et al. (1999). However, this version needed improving because: (a) some scales had a low number of items so the content to be measured was under-represented; (b) in some scales the number of "negative-meaning" items was higher than the number of "positive-meaning" items; (c) some items were "double-meaning" (e.g. "in this neighbourhood the buildings are nice and well-kept"); (d) some items were too long. The poor internal consistency of some indexes reflected these flaws.

2. Objectives and hypotheses

This study aims at setting up a new version of PREQ and NA used in previous studies (see Bonnes et al., 1997; Bonaiuto et al., 1999). More specifically, it attempts to reduce the number of items in each scale by selecting those elements that better represent each indicator.

The research hypotheses are thus the following:

(a) confirmation of structure and number for PREQ and NA with respect to previous versions;
(b) improvement of their psychometric qualities (i.e. internal consistency) by selecting the best fitting items.

3. Method

3.1. Participants

312 residents were sampled in seven different Roman neighbourhoods. The neighbourhoods (balanced for the main socio-demographic and residential indexes) were selected by a team of architects of Rome's "La Sapienza" University ("ITACA" Department) according to parameters such as architectural and urban planning, human density and location. Neighbourhood residents were carefully selected for quotas as socio-demographically balanced as possible (for gender, age, etc.).

3.2. Instruments

A new "contextual mapping" phase (Stokols, 1987) was added to increase index content validity by creating new items and modifying old ones in order to solve methodological flaws of previous versions.

Eleven PREQ scales (362 items) and one NA scale (16 items) were thus created. The Likert-type scale consists of seven steps, from "totally agree" to "totally disagree". In each scale, half of the items express presence of environmental quality, the other half express lack of quality. The number of items included in each scale is proportional to the dimensions expected according to previous investigations (see Bonnes et al., 1997).

The scales included in each referent content area are:

Architectural/town-planning features (three scales):

- Architectural and town-planning space (52 items)
- Organization of accessibility and roads (32 items)
- Green areas (18 items)
  Socio-relational features (one scale):
- People and social relations (48 items)
  Functional features (four scales):
- Welfare services (28 items)

- Recreational services (32 items)
- Commercial services (16 items)
- Transport services (16 items)
  Context features (three scales):
- Pace of life (32 items)
- Environmental health (16 items)
- Upkeep and care (32 items)
  Neighbourhood attachment (one scale):
- Neighbourhood attachment (16 items)

3.3. Procedure

Data were gathered using a self-report questionnaire delivered to participants' homes by trained interviewers.

3.4. Data analysis

A preliminary series of Principal Component Analyses (PCAs) was run on each of the 12 scales to establish the more reliable factorial solutions and eliminate any items not represented.

Factor extraction was carried out by using the "Screen Test" and a factor interpretability criterion. For multifactor structures, a preliminary Oblimin rotation was run to test for any correlation between factors. When a correlation was <0.20, a Varimax rotation for orthogonal factors was run to obtain a simple structure.

A new series of PCAs was run to obtain simpler factorial solutions. Items loading <0.45 in whichever factor or presenting high factor loadings in more than one factor were eliminated.

Cronbach's Alpha was then calculated to test factor reliability: items showing a low inter-correlation with the factor or which consistently lowered the Alpha index were eliminated.

4. Results

Statistical processing produced 19 PREQ and 1 NA indicators.

All factors (except one) were bipolar, i.e. consisting of both positive-sense items indicating presence of environmental quality and negative-sense items indicating absence of environmental quality.

For clearer reading and comprehension, some factors were inverted to always obtain positive-sign factor loadings in positive-sense items (i.e. items indicating presence of quality), and vice versa.

The following 20 indicators were found.

4.1. Architectural/town-planning features

Scale 1. *Architectural and town-planning space*
PCA extracted three correlated factors (see Table 1)[1]

- Factor I: "Building aesthetics", eight items[2] (four positive and four negative).

  Positive-sense items concern the beauty and pleasantness of buildings, while negative-sense items concern their unpleasantness of shape and colour.
- Factor II: "Building density", eight items (four positive and four negative).

  Positive-sense items refer to the presence of sufficient space among buildings and balance among built-up areas and open spaces. Negative-sense items refer to lack of space among buildings and too much built-up space.
- Factor III: "Building volume", six items (all negative), concerning excessive size of buildings.

Scale 2. *Organization of accessibility and roads*
PCA extracted two orthogonal factors (see Table 2).

- Factor I: "Internal practicability", eight items (four positive and four negative).

  Positive-sense items concern neighbourhood suitability for walking, biking and parking. Negative-sense items concern a lack of parking lots and space for moving on foot or by bike.
- Factor II: "External connections", six items (four positive and two negative).

Positive-sense items concern good neighbourhood connections with the city-centre and other city areas. Negative-sense items concern neighbourhood isolation and difficulties in reaching the neighbourhood from other parts of the city.

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[1] In case of multi-factorial structures, the percentage of explained variance for each factor reported in the tables is always intended before rotation.

[2] The items presented in the tables are a short-form English translation of the original Italian items. Typically, the word "neighbourhood" is present in the original wording of each item.

Table 1
PCA scale 1: Architectural and town-planning space (total items = 22)

Items	F1	F2	F3
Buildings are beautiful	0.90	−0.00	0.02
Building details are well-made	0.87	0.02	−0.16
It is pleasant to see this neighbourhood	0.79	0.07	0.00
Buildings are unpleasant	−0.78	0.05	−0.19
The buildings have an unpleasant shape	−0.73	0.11	−0.30
Buildings are made of good materials	0.71	0.21	−0.18
This neighbourhood is aesthetically unpleasant	−0.69	−0.10	−0.11
Buildings have unpleasant colours	−0.60	0.02	−0.16
Buildings are well-detached	−0.07	0.91	−0.05
There is enough space between buildings	0.12	0.89	−0.09
There is little space between buildings	0.07	−0.84	−0.11
Buildings are too close together	0.07	−0.84	−0.20
Buildings are too clustered	−0.03	−0.78	−0.07
This is a roomy neighbourhood	0.23	0.61	−0.08
The built-up space is too much	−0.17	−0.51	−0.24
Open spaces and built-up areas are well-balanced	0.26	0.48	0.11
Buildings are too tall	0.11	0.02	−0.86
The size of some buildings is excessive	−0.08	−0.02	−0.75
Buildings are too large	−0.27	−0.19	−0.70
The dimension of buildings is oppressive	−0.24	−0.15	−0.60
The volume of buildings is too big	−0.31	−0.11	−0.56
Buildings are too tall compared to the width of streets	−0.13	−0.24	−0.54
Alpha	0.92	0.92	0.89
Eigenvalue	11.17	1.92	1.61
Explained variance (%)	50.8	8.7	7.3
Total explained variance (%)		66.8	

r(F1F2) = 0.57; r(F1F3) = 0.47; r(F2F3) = 0.44. F1: Building aesthetics; F2: Building density, F3: Building volume.

Table 2
PCA scale 2: Organization of accessibility and roads (total items = 14)

Items	F1	F2
It is easy to cycle around	0.71	−0.05
Parking places and parking lots are lacking	−0.68	0.10
There is a good availability of parking spaces	0.66	−0.02
There is not enough space to walk	−0.65	−0.18
It is dangerous to cycle	−0.65	0.04
Parked cars impede walking	−0.64	−0.13
This neighbourhood is well-suited for handicapped people	0.63	0.24
Streets are wide enough	0.53	0.18
This neighbourhood is well-connected with important parts of the city	0.01	0.84
The city-centre can be easily reached from this neighbourhood	−0.11	0.82
This neighbourhood is too cut-off from the rest of the city	−0.03	−0.70
It is easy to go out from this neighbourhood	0.08	0.62
There is a large choice of roads to get out of the neighbourhood	0.10	0.60
Going into this neighbourhood means going round in circles	−0.32	−0.50
Alpha	0.80	0.78
Eigenvalue	3.80	2.68
Explained variance (%)	27.2	19.1
Total explained variance (%)		46.3

F1: Internal practicability; F2: External connections.

Table 3
PCA scale 3: Green areas (total items = 10)

Items	F1
There is no park where children can play freely	−0.83
There are green areas for relaxing	0.82
There are enough green areas	0.80
Green areas are in good condition	0.76
Going to a park means travelling to other parts of the city	−0.73
There is at least a garden/park where people can meet	0.69
Many green areas are disappearing	−0.66
The green areas are well-equipped	0.64
The green areas are too small	−0.58
Most green areas are closed to the public	−0.56
Alpha	0.89
Eigenvalue	5.08
Explained variance (%)	50.8

F1: Green areas.

Scale 3. *Green areas*

PCA extracted one factor (see Table 3) containing 10 items (five positive and five negative).

Positive-sense items refer to usability of neighbourhood green areas for relaxing, social meetings, child play-areas. Negative-sense items concern the lack or unsuitability of neighbourhood green areas.

4.2. Socio-relational features

Scale 4. *People and social relations*

PCA extracted three orthogonal factors (see Table 4).

- Factor I: "Discretion and civility", eight items (four positive and four negative).

    Positive-sense items concern the presence of discreet civil people in the neighbourhood. Negative-sense items concern feelings of lack of privacy, annoyance by gossip, being controlled and overcrowding.

- Factor II: "Security and tolerance", eight items (two positive and six negative).

    Positive-sense items concern neighbourhood safety in the streets and during the night. Negative-sense items concern risk of dangerous night encounters, presence of incivility and people considered dangerous, residents' intolerance of noise and "diverse" people.

- Factor III: "Sociability and cordiality", eight items (four positive and four negative).

Positive-sense items concern ease of socialization and presence of cordial, altruistic and cooperative people in the neighbourhood. Negative-sense items concern a tendency towards isolation, formal interpersonal relationships, low sociability and poor friendship-building.

4.3. Functional features

Scale 5. *Welfare services*
PCA extracted two correlated factors (see Table 5).

- Factor I: "School services", six items (three positive and three negative).

    Positive-sense items concern good neighbourhood school quality and quantity and being easy to reach. Negative-sense items concern the lack, poor quality and low care of neighbourhood schools.

- Factor II: "Social-care services", six items (two positive and four negative).

Positive-sense items concern the good social service provided by local health and municipal police authorities. Negative-sense items concern inadequate neighbourhood social, health and elderly-care services.

Scale 6. *Recreational services*
PCA extracted two correlated factors (see Table 6).

- Factor I: "Sport services", eight items (four positive and four negative).

    Positive-sense items concern adequate outdoor and indoor neighbourhood sports facilities. Negative-sense items concern a lack of facilities.

- Factor II: "Socio-cultural activities", eight items (four positive and four negative).

Positive-sense items concern the presence of neighbourhood cultural venues and events, theatres, cinemas and libraries. Negative-sense items concern the lack of cultural attractions, entertainments and meeting points.

Scale 7. *Commercial services*
PCA extracted one factor (see Table 7) containing eight items (four positive and four negative).

Positive-sense items concern the variety and easy-reaching of neighbourhood shops. Negative-sense items concern poor shop variety.

Table 4

PCA scale 4: People and social relations (total items = 24)

Items	F1	F2	F3
You feel watched	−0.75	−0.17	−0.02
People are discreet	0.74	−0.04	0.00
People gossip too much	−0.71	−0.22	0.07
You feel controlled by others	−0.71	−0.21	−0.17
People are not intrusive	0.69	−0.02	−0.16
People are civil	0.52	0.14	0.29
You feel free to behave as you like	0.48	0.22	0.05
This neighbourhood is too crowded	−0.43	−0.25	−0.05
Late in the evening there is the risk of dangerous encounters	−0.10	−0.82	0.10
It is not risky to go around late evening	0.15	0.70	0.19
The streets are safe enough	0.30	0.67	0.18
You can meet bad people	−0.36	−0.61	−0.14
People often behave uncivilly	−0.40	−0.61	−0.00
Green areas are frequented by bad people	−0.31	−0.60	−0.23
Generally, residents do not tolerate noise	0.30	−0.49	0.01
Residents do not tolerate the presence of foreigners	−0.10	−0.48	−0.28
It is easy to get to know people	0.09	−0.02	0.70
People are interested in others	0.07	−0.05	0.67
People tend to be isolated	0.03	−0.15	−0.67
People only have formal relationships	0.13	−0.14	−0.60
People are not very sociable	−0.05	−0.28	−0.60
People are cordial	0.21	0.10	0.60
It is difficult to make friends with people	0.10	−0.17	−0.60
People cooperate easily	0.06	0.14	0.57
Alpha	0.81	0.82	0.80
Eigenvalue	6.10	3.16	1.88
Explained variance (%)	25.4	13.2	7.8
Total explained variance (%)		46.4	

F1: Discretion and civility; F2: Security and tolerance; F3: Sociability and cordiality.

Table 5

PCA scale 5: Welfare services (total items = 12)

Items	F1	F2
This neighbourhood has good school facilities	0.82	−0.15
Children and teenagers are forced to move from this neighbourhood to go to school	−0.79	0.05
Schools can be easily reached on foot	0.71	−0.07
Schools are generally good	0.68	0.16
Schools are generally poor	−0.65	−0.17
Schools are located in bad-quality buildings	−0.57	−0.13
The local health service is satisfactory	−0.02	0.72
The local health service is inadequate	−0.08	−0.68
Social services are inadequate	−0.17	−0.66
Elderly care services are lacking	−0.09	−0.61
The municipal police also provide useful social services	−0.16	0.59
Municipal office opening hours are inadequate	−0.04	−0.55
Alpha	0.81	0.73
Eigenvalue	3.97	1.80
Explained variance (%)	33.1	15.0
Total explained variance (%)		48.1

r(F1F2) = 0.30; F1: School services; F2: Social-care services.

Table 6
PCA scale 6: Recreational services (total items = 16)

Items	F1	F2
There are areas where you can do outdoor sports	0.87	−0.16
If you like jogging, this neighbourhood is suitable	0.85	−0.16
Outdoor sport areas are not sufficient	−0.77	0.06
This neighbourhood is well-equipped with sports grounds	0.67	0.13
You can do various sports	0.64	0.29
Sports grounds are insufficient	−0.60	−0.27
If you like cycling, this neighbourhood is not suitable	−0.58	−0.08
You cannot do various sports	−0.57	−0.18
In the evening this neighbourhood offers various attractions	−0.30	0.83
There are often cultural events	0.08	0.65
There are few cultural events	−0.12	0.65
This neighbourhood is not well-equipped to host cultural events	−0.11	−0.62
Entertainment activities for residents are lacking	−0.23	−0.60
The lack of meeting places does not allow young people to spend their free time in the neighbourhood	−0.09	−0.58
This neighbourhood is well-served with cinemas	0.07	0.56
Libraries are adequate for residents' needs	−0.07	0.56
Alpha	0.87	0.81
Eigenvalue	5.78	2.18
Explained variance (%)	36.1	13.6
Total explained variance (%)		49.7

r(F1F2) = 0.36; F1: Sport services; F2: Socio-cultural activities.

Scale 8. *Transport services*

PCA extracted one factor (see Table 8) containing eight items (four positive and four negatives).

Positive-sense items concern good neighbourhood public transport frequency, variety, distribution and connections. Negative-sense items concern the lack of comfort and overcrowding in public transport.

Table 7
PCA scale 7: Commercial services (total items = 8)

Items	F1
Anything can be found in the neighbourhood's stores	0.83
This neighbourhood is well-served with stores	0.80
There are all kinds of stores	0.76
Special things are lacking in the neighbourhood's stores	−0.70
Stores do not provide a wide range of products	−0.68
To buy special things one should go out from the neighbourhood	−0.66
Stores are not well-distributed	−0.65
Stores selling the most needed products can be easily reached	0.64
Alpha	0.86
Eigenvalue	4.13
Explained variance (%)	51.7

F1: Commercial services.

4.4. Context features

Scale 9. *Pace of life*
PCA extracted two correlated factors (see Table 9).

- Factor I: "Relaxing versus distressing", eight items (four positive and four negative).

Table 8
PCA scale 8: Transport services (total items = 8)

Items	F1
The quality of public transportation is poor	−0.81
The frequency of public transport is adequate for residents' needs	0.72
The time spent waiting for public transport is too long	−0.72
There is enough choice of public transportation	0.72
Public transport provides good connections with the rest of the city	0.64
Buses are too uncomfortable	−0.63
Bus stops are well-distributed	0.56
Buses are overcrowded	−0.51
Alpha	0.82
Eigenvalue	3.62
Explained variance (%)	45.2

F1: Transport services.

Table 9
PCA scale 9: Pace of life (total items = 16)

Items	F1	F2
The chaos is unbearable	−0.83	0.07
There is no peace and quiet	−0.80	0.07
Living in this neighbourhood is quite distressing	−0.78	−0.10
There is a peaceful pace of life	0.75	−0.11
There is a calm atmosphere	0.71	0.13
It is impossible to relax	−0.69	−0.05
This neighbourhood is an oasis of tranquillity	0.69	−0.01
If compared with the chaos of other areas, this neighbourhood is still liveable	0.65	0.07
It is fun to spend your free time	0.18	0.76
Only a few things can be done	−0.08	−0.72
Every day something interesting happens	−0.13	0.68
It is difficult to get bored	0.02	0.68
This neighbourhood is very boring	−0.17	−0.68
This neighbourhood is full of activity	−0.09	0.67
Nothing happens	0.13	−0.61
Days always seem the same	−0.16	−0.60
Alpha	0.88	0.84
Eigenvalue	5.49	2.89
Explained variance (%)	34.3	18.0
Total explained variance (%)		52.4

r(F1F2) = 0.24; F1: Relaxing vs. distressing; F2: Stimulating vs. boring.

Positive-sense items concern a quiet peaceful pace of life in the neighbourhood. Negative-sense items concern a chaotic distressing pace of life.
- Factor II: "Stimulating versus boring", eight items (four positive and four negative).

Positive-sense items concern the presence of interesting and stimulating neighbourhood events and activities. Negative-sense items concern the lack of any events.

Scale 10. *Environmental health*
PCA extracted one factor (see Table 10) containing eight items (four positive and four negative).
Positive-sense items concern the presence of a clean neighbourhood environment. Negative-sense items concern the presence of air and noise pollution.

Scale 11. *Upkeep and care*
PCA extracted one factor (see Table 11) containing 12 items (six positive and six negative).

Table 10
PCA scale 10: Environmental health (total items = 8).

Items	F1
Residents' health is threatened by pollution	−0.87
The air is clean	0.86
This neighbourhood is generally not polluted	0.86
This is a polluted neighbourhood	−0.84
There is too much noise	−0.80
The heavy traffic in this neighbourhood is very annoying	−0.79
This is a quiet neighbourhood	0.75
This is a clean neighbourhood	0.58
Alpha	0.92
Eigenvalue	5.10
Explained variance (%)	63.8

F1: Environmental health.

Positive-sense items concern residents' care for their neighbourhood and good condition of road signs, streets and refuse collection. Negative-sense items concern residents' poor civility and presence of abandoned places, dirty walls, holes in the street, poor condition of buildings, insufficient lighting.

4.5. Neighbourhood attachment

Scale 12. *Neighbourhood attachment scale*
PCA extracted one factor (see Table 12) containing eight items (four positive and four negatives).

Table 11
PCA scale 11: Upkeep and care (total items = 12)

Items	F1
Residents show care for their neighbourhood	0.72
There are too many holes in the neighbourhood's streets	−0.69
Residents avoid dirtying the place	0.66
Residents do not respect the environment	−0.66
Many buildings are in poor condition	−0.63
Road signs are well-kept	0.63
There are signs of incivility on too many walls	−0.61
The refuse collection service is efficient	0.61
Streets are regularly cleaned	0.61
Cars are parked properly	0.55
There are too many abandoned areas	−0.54
Street lighting is often insufficient	−0.52
Alpha	0.85
Eigenvalue	4.64
Explained variance (%)	38.7

F1: Upkeep and care.

Table 12
PCA scale 12: Neighbourhood attachment (total items = 8)

Items	F1
This is the ideal neighbourhood for me	0.83
I would willingly live in another neighbourhood	−0.83
This neighbourhood is part of me	0.82
It would be very hard for me to leave this neighbourhood	0.81
I have nothing in common with this neighbourhood	−0.78
I identify with the people of this neighbourhood	0.77
I do not subscribe to this neighbourhood's life-style	−0.72
I do not feel integrated in this neighbourhood	−0.68
Alpha	0.91
Eigenvalue	4.88
Explained variance (%)	61.0

F1: Neighbourhood attachment.

Positive-sense items concern the presence of neighbourhood attachment, whereas negative-sense items concern the lack of neighbourhood attachment.

5. Discussion and conclusion

Factor structures and indicator number confirm previous research (see Bonnes et al., 1997; Bonaiuto et al., 1999). Only the "Upkeep and care" scale shows a difference, being mono-dimensional, comprising "macro-upkeep" (public administration under-responsibility) and "micro-upkeep" (residents' under-responsibility).

Among multi-dimensional scales, higher inter-factor relationships are in the "Architectural and town-planning space" scale: between building "density" and "volume" ($r = 0.57$), between building "density" and "aesthetics" ($r = 0.47$), and between building "volume" and "aesthetics" ($r = 0.44$).

Hence, it appears that the better one of the three visual-perceptual qualities of the built-up space is, the better the other two qualities are in residents' evaluation, and vice versa. In other words, people who are more satisfied with, say, building density or volume tend to find a better aesthetic quality of buildings.

Similarly, a moderately positive relationship emerged between "sports" facilities and "cultural" activities ($r = 0.36$) in the "recreational services" scale as well as between "school" and "social-care" services ($r = 0.30$) in the "welfare services" scale.

A weakly positive relationship appeared between the two bipolar dimensions (i.e. "relaxing versus distressing" and "stimulating versus boring", $r = 0.24$) extracted from the "pace of life" scale, each of them containing an arousing pattern (negative in the first factor, positive in the second factor) in one pole and a relaxing pattern (positive in the first factor, negative in the second factor) in the other.

The remaining multi-dimensional scales, i.e. "people and social relationships" and "organization of accessibility and roads", yielded independent dimensions. This is surprising for the "people and social relationships" scale, since dimensions such as discretion/civility, security/tolerance and sociability/cordiality would be expected to correlate with people's perception, as seen in previous research (Bonnes et al., 1997). Conversely, the independence of dimensions in the "organization of accessibility and roads" scale was expected and confirmed since perceptions of "practicability of internal spaces" and "good connections with other parts of the city" refer to different spatial elements: the first concerns people's movements (i.e. on foot, by car, by bike) within the neighbourhood, whereas the second concerns interaction between the neighbourhood and other urban areas.

The mono-dimensional scales yielded the following distinct indicators: green areas, commercial services, transport services, environmental health, upkeep/care.

As regards psychometric qualities, the new version of PREQ indicators largely improves internal consistency. In fact, Cronbach Alphas range from 0.92 to 0.73 and are <0.80 only in two cases. The NA scale shows a single indicator with good internal consistency (Alpha = 0.91), thus confirming this scale's mono-dimensionality even though further items were added to assess its possible multi-dimensionality.

A considerable reduction of items for each scale was a further important result of this investigation, since it allowed having more manageable, reliable and consistent instruments. The present version of these scales (i.e. 150 items included in 11 PREQ scales and eight items included in the NA scale) is being administered in a study involving a large national sample considering a representative range of different Italian urban typologies (based on size, location, urban planning features, socio-cultural attributes, etc.). Hence, the next step is to validate the factor structure of the

scales by confirmatory factor analysis and to formalise a model for the relationship between different indicators, from socio-demographics and residential experience indicators to PREQ and NA indicators.

A further research line to be developed is a comparison between residents' perceived quality of neighbourhoods and experts' technical evaluations of the same places, to assess when these two evaluations converge and when they diverge (see Bonnes and Bonaiuto, 1995). This would be a step forward in furthering our knowledge of "subjective" and "objective" environmental evaluations that can subsequently be considered, compared and complemented within environmental management strategies and interventions (Bonaiuto and Bonnes, 2002).

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Marino Bonaiuto is now full professor of Social Psychology of Communication at the University of Rome "La Sapienza". He was previously researcher and associate professor and received his PhD in social and developmental psychology. He is member of IAPS (International Association of People-environment Studies). His main research interests in Environmental Psychology include: clarification of new social-psychological theories used in Environmental Psychology; social identity in regulating people attitudes and actions toward places, particularly in presence of social conflict during environmental management; communication and discursive approaches in Environmental Psychology; elaboration of psychometric tools to measure relevant constructs in Environmental Psychology. Moreover, recent consultancies for architects, urban planners, local administrations, referred to: renewal of depressed urban residential areas; residential post-occupancy evaluation; monitoring of green urban areas; design of a new paediatric hospital.

Ferdinando Fornara is a PhD student in Social Psychology at the University of Rome "La Sapienza". He received a MSc in environmental psychology (2000) at the University of Surrey (UK) and collaborated to a European project about the influences of

spatial and physical features of railway stations on users' perceptions of fear of crime. His research interests include residential satisfaction, attitudes and behaviours toward urban green, users' perception of hospital environments, post-occupancy evaluation of renewed urban areas, elaboration of psychometric tools to measure users' and architects' environmental assessments.

Mirilia Bonnes is full professor of Environmental Psychology at the University of Rome "La Sapienza". She is member and past President of UNESCO-MAB Italian Committee. Her research interests refer to the "Theory of Place" in environmental psychology and to social psychological approaches to environmental and sustainability issues.