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Impact of the hospital built environment on treatment satisfaction of psychiatric in-patients

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Abstract

Background. A hospital built environment can affect patients' treatment satisfaction, which is, in turn, associated with crucial clinical outcomes. However, little research has explored which elements are specifically important for psychiatric in-patients. This study aims to identify which elements of the hospital environment are associated with higher patient satisfaction with psychiatric in-patient care.

Methods. The study was conducted in Italy and the United Kingdom. Data was collected through hospital visits and patient interviews. All hospitals were assessed for general characteristics, aspects specific to psychiatry (patient safety, mixed/single-sex wards, smoking on/off wards), and quality of hospital environment. Patients' treatment satisfaction was assessed using the Client Assessment of Treatment Scale (CAT). Multi-level modelling was used to explore the role of environment in predicting the CAT scores adjusted for age, gender, education, diagnosis, and formal status.

Results. The study included 18 psychiatric hospitals (7 in Italy and 11 in the United Kingdom) and 2130 patients. Healthcare systems in these countries share key characteristics (e.g. National Health Service, care organised on a geographical basis) and differ in policy regulation and governance. Two elements were associated with higher patient treatment satisfaction: being hospitalised on a mixed-sex ward ($p = 0.003$) and the availability of rooms to meet family off wards ($p = 0.020$).

Conclusions. As hospitals are among the most expensive facilities to build, their design should be guided by research evidence. Two design features can potentially improve patient satisfaction: family rooms off wards and mixed-sex wards. This evidence should be considered when designing or renovating psychiatric facilities.

Introduction

The physical environments of in-patient facilities have been shown to influence the way in which healthcare is delivered. Healthcare delivery is also influenced by other factors, such as cultural attitudes and assumptions of the wider society within which the facility is located and staff attitudes to the management of psychiatric patients. The term 'therapeutic milieu' has been used to describe the physical, social, and cultural context of providing psychiatric care in a holistic manner that supports positive health outcomes (Thomas, Shattell, & Martin, 2002). Existing evidence suggests that the physical environment of in-patient facilities can increase the staff efficiency and reduce the patients' hospital stay (Ulrich et al., 2008), facilitate positive interactions between patients and staff (Curtis, Gesler, Priebe, & Francis, 2009; Jovanović, Campbell, & Priebe, 2019), and contribute to patients' feelings of control and safety (Bowers et al., 2006; Evans, 2003). Little is known if and how these effects translate into patient treatment satisfaction.

Patients' treatment satisfaction is a key indicator of the quality of psychiatric care. Previous studies showed that more satisfied patients have better health outcomes (Chue, 2006) and reduced likelihood of rehospitalisation (Priebe et al., 2009). Along with the quality of the received care, the hospital built environment has been identified as a factor influencing patient treatment satisfaction (Harris, McBride, Ross, & Curtis, 2002). Research in this field has been limited to the ambient and sensory components of the built environment (e.g. it has been repeatedly shown that patients are more satisfied if rooms and wards are clean and quiet) and has been conducted mainly in non-psychiatric settings (MacAllister, Zimring, & Ryherd, 2016; Ulrich et al., 2008). We have identified three studies conducted in psychiatric hospitals. Remnik and colleagues surveyed 100 patients and found no association between patient satisfaction and the built environment (Remnik, Melamed, Swartz, Elizur, & Barak, 2004). Long and colleagues moved nine patients from an adapted Victorian unit to a purpose-built facility, which was associated with increased patient satisfaction with the physical environment (decorative features, social areas with windows, better access to outdoors, and interior green spaces) (Long, Langford, Clay, Craig, & Hollin, 2011). A study in a Finnish psychiatric hospital found that patients were most satisfied with staff–patient relationships, and reported most dissatisfaction in the areas of information, restrictions, compulsory care, and the built environment. Interestingly, out of seven elements of the built environment explored in the study, spatial opportunities to interact with other patients and meet relatives and friends were most appreciated by patients (Kuosmanen, Hätönen, Jyrkinen, Katajisto, & Välimäki, 2006).

The robust research evidence required to inform guidance on how psychiatric in-patient settings should be designed to maximise patients treatment satisfaction is lacking. The present study aims to fill this knowledge gap. The theoretical framework for this study is based on the multi-place theory and the model of a prosocial hospital environment. According to the multi-place theory, each hospital can be considered as a system of sub-places that are associated with patients' goals and activities (Bonnes & Secchiaroli, 1995). This concept allows for better investigating of the multifaceted nature of hospitals (Fornara, 2005). In particular, the sub-places investigated in this study are the hospital's external spaces, the overall hospital care unit/ward, the patients' bedrooms and the ward's external spaces. Based on our previous work, prosocial hospital environment includes characteristics of the hospital built environment that can facilitate social interactions among patients, staff and visitors, such as the central location of the hospital, availability of single bedrooms, range of social spaces and access to external areas (Jovanović et al., 2019). This study also explored several aspects specific to psychiatric in-patient settings, such as patient safety, mixed/single-sex wards and smoking on/off wards. Lastly, we included experts' quality appraisal of the built environment. This is how aspects of the hospital built environment were selected to be studied and tested for their association with patients' treatment satisfaction in this study. We assessed these aspects in 18 hospitals across Italy and England and explored which aspects were associated with higher treatment satisfaction of patients.

Methods

This quasi-experimental study is part of a project funded by the European Commission that assessed psychiatric patients during hospital admission (Giacco et al., 2015). In total, 18 hospitals were included in the present study; 11 in England and 7 in Italy. Wards included in the study were acute psychiatric wards. The data were collected between October 2015 and December 2016 through on-site hospital visits and patient interviews.

In England, three hospitals were located in London (Newham, Tower Hamlets, Redbridge), three in the East of England (Chelmsford, Colchester, Harlow), three in the South-East (Aylesbury, Littlemore, Warneford), and two in the North (North Manchester, Tameside). In Italy, participating hospitals were all located in the Veneto region (North-East of the country): two hospitals were in the city of Verona and one in each of the following cities: Bussolengo, Treviso, Cittadella, Vicenza and Adria.

Healthcare systems in England and Italy share several key characteristics (Giacco et al., 2015). Both run a national health service with healthcare services provided by public organisations and funded by taxes. Moreover, care is organised on a geographical basis: a patient's place of residence determines their allocation to a given hospital, it is not influenced by personal or clinical characteristics or by choice of the patient. There are some differences in policy regulation and governance. For example, in Italy, most powers are governed by regions, while in the UK, the healthcare system is guided by national guidelines and targets; however, there is large autonomy for implementation.

Hospital built environment

All participating hospitals were assessed during hospital visits by an interdisciplinary team, including a psychiatrist-architect (NJ), an architect (MAM) and a psychologist (EM). In each hospital, a staff member led a tour of the hospital and provided with floor plans. During the visits, data were collected through observation and discussion with one or more staff members.

Data collection included: (a) general information about the site and hospital building (hospital location, building typology, ward typology) and type and number of distinctive sub-places covering ward communal and therapy areas, patient bedrooms, and outdoor areas; (b) three aspects specific to psychiatry (patient safety, mixed/single-sex wards, smoking on/off wards) and (c) experts' quality appraisal of the environment (an adapted version of Expert Observation Grid). The Expert Observation Grid was developed to measure a degree of architectural humanisation in orthopaedics hospitals (Fornara, Bonaiuto, & Bonnes, 2006) and was shown to have good validity and good test–retest reliability (Andrade, Lima, Fornara, & Bonaiuto, 2012). Prior to this study, the instrument was adapted for psychiatric hospital setting in collaboration with the authors of the original instrument. The instrument was piloted in London with five architects, three psychiatrists, two mental health patients and one psychologist, and finalised based on received feedback. The Expert Observation Grid is composed of 94 items covering spatial–physical indicators of humanisation of three subplaces: (a) external space, including all areas before patients, come to the ward (23 items); (b) ward, including communal areas, therapy spaces, and outside areas (51 items); and (c) patients rooms (20 items). Experts provide scores on 5-point Likert-type scales for different items such as quality of design solutions, quality of construction materials, clarity of signs etc. In order to define the degree of 'objective' spatial–physical humanisation of hospitals, a mean score was computed between the evaluators for each of the three areas. More humanised in-patient units receive higher scores.

Patient interviews

The included patients were above 18, hospitalised in a psychiatric in-patient unit, with a primary diagnosis of ICD-10 psychotic/affective/anxiety disorder, and with a capacity to provide informed consent. Patients with organic brain disorders and severe cognitive impairment were excluded. Patients were interviewed within the first week after admission. There is good evidence that patient satisfaction predicts outcomes right from the initial stages of treatment, e.g. when assessed within the first two days of hospital care (Priebe et al., 2011). The UK hospitals and some Italian hospitals included in this study offer ward tours to patients on the day of admission, which allows them to familiarise themselves with the ward environment early. Data on socio-demographic characteristics, psychiatric diagnosis and

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formal status at admission were collected. Patients were asked to express their appraisal of care, as measured by the Client Assessment of Treatment (CAT) (Priebe, Gruyters, Heinze, Hoffmann, & Jäkel, 1995). The CAT was developed to assess patient's satisfaction with different aspects of in-patient care. The CAT is a global measure of treatment satisfaction in a hospital environment and, as such, is found to be the most established scale that exists in the literature for in-patient treatment (Miglietta, Belessiotis-Richards, Ruggeri, & Priebe, 2018). The instrument consists of seven items, patients are asked to respond on a 10-points Likert-type scale, and the overall mean score is taken as a measure of treatment satisfaction. Higher CAT values indicate higher treatment satisfaction. The CAT has shown to display good psychometric properties (Richardson et al., 2011). A detailed description of the study procedure can be found elsewhere (Bird et al., 2018).

Statistical analysis

Descriptive statistics were used to report patient characteristics, CAT scores, and elements of the built environment for each hospital; mean and standard deviation or frequencies were used as appropriate. The mean for the CAT was calculated for each patient. If more than two items were missing for the CAT, these cases were excluded from the analysis. The frequency distribution of individual CAT scores was not normal (notable negative asymmetry was present). No adequate link function could be found to use raw data in generalised linear mixed models. Linear mixed models that can also be used with nested data assume normality of residuals; we computed the normalised (Rankit) scores and modelled such transformed scores. Mixed effect linear regression was performed by SPSS 23.0 software. It was used to explore the predictive value of elements of the hospital built environment (Level-2 predictors) in predicting the normalised CAT scores as an outcome variable. To enable the comparison of different models' fit, a full maximum likelihood method was used for parameter estimation. In Model 1.1, Level-1 predictors that were considered as confounders, e.g. patient age, gender, education (standardised within-group; see Enders & Tofighi, 2007 on the advantages of the group-mean centring), diagnosis of psychosis and voluntary admission – were entered simultaneously in the model. Model 1.2 was built with significant Level-1 predictors only (all from above but the diagnosis of psychosis which was not statistically significant at the 5%). Next, several models were built (Models 2.1–2.12) with a single Level-2 predictor (elements of the hospital built environment) added to the Model 1.2 predictors to examine the possible role of specific environment variables. The elements of the hospital built environment (Level-2 predictors) included in the final model were divided into categorical variables (hospital location: suburbs *v.* city centre; wards: mixed *v.* single-sex; patient bedrooms: single/multi-bed/mixed; patient bathrooms: shared *v.* private; patient safety: patient rooms locking *v.* no locking available; the patient can meet with families: on *v.* off ward; smoking: indoors/outdoors/banned); and continuous variables (the number of individual therapy rooms per ward; the number of group therapy rooms per ward; the number of communal areas per ward; the number of outdoor areas; Expert Observation Grid total score). Other variables (as listed in Tables 1 and 2) were not included in the final model because they either lacked sufficient variation within the sample or were significantly correlated with other variables. Each Level-2 predictor was fitted in a separate model and its added value was assessed by comparing the second-order bias-corrected AIC (AICC) of Model 1.2 to AICC of the tested model. To assess the moderating role of gender, additional models were tested that included an interaction between a particular Level-2 predictor and gender. Level-1 and Level-2 predictors were included as fixed effects and a random intercept for a hospital was included. Variances of intercepts, error variance and covariances were estimated. Statistical hypotheses were tested at the 5% alpha error rate.

Ethics approval

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. All procedures involving human subjects/patients were approved by ethics committees in Italy (Comitati Etici per la sperimentazione clinica delle provincie di Verona, Rovigo, Vicenza, Treviso, Padova) and the UK (National Research Ethics Committee North East – Newcastle & North Tyneside, ref: 14/NE/1017).

Results

Study participants

The study included 2130 participants, 1430 (67.1%) in England and 700 (32.9%) in Italy. The sample was balanced in terms of gender and included 1186 (55.8%) men and 940 (44.2%) women. Their mean age was 41.8 years (S.D. 13.9). The majority of patients were diagnosed with psychosis ($n = 877$, 41.2%) and were admitted voluntarily ($n = 1445$, 68%), as shown in Table 3. In Italy, the study included 53% (range 34–77%) of all admitted patients and this was 75.6% (range 64–90%) of all eligible patients. For the UK, we have trust-level data which can be used as an approximation and the study included 36% (range 29–51%) of all admitted patients within participating trusts and this was 51% (range 45–62%) of all eligible patients at a trust level, as shown in Table 1.

Hospital built environment

Characteristics of the hospitals are summarised in Tables 1, 2 and 4.

General information about the hospital buildings

The majority of facilities were placed within general hospitals ($n = 15$), most of which were located in the suburbs ($n = 13$), and were purpose-built ($n = 12$). The facilities varied substantially in the types of floor plans, e.g. 'L'-shaped floor plan was found in five settings, while other types included 'I' plan ($n = 4$), 'T' plan ($n = 3$) and '+' plan ($n = 3$). Hospital spaces were arranged on the ground floor (six facilities) and on the ground and first floors (eight facilities) of the buildings, as shown in Tables 1 and 2.

Type and number of distinctive sub-places

We identified several distinctive sub-places such as communal and therapy areas, patient bedrooms and outdoor areas. Most facilities ($n = 16$) provided at least two separate communal areas, namely a lounge and a dining room. The mean number of communal areas was 4.02 (S.D. 1.6; range 1–6). In ten hospitals, patients were able to meet with family members and visitors off wards, while in the other eight hospitals, visiting rooms were only onwards as part of the lounge/dining room, available to all patients at all

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Table 1. General characteristics of hospitals included in the study, CAT and GRID scores

	Hospital	No. of patients interviewed (%)	% of total trust/ hospital admissions[a]	Hospital typology[b]	Location	Purpose built/ adaptation[c]	Maximum floors number[d]	CAT score mean (S.D.)	GRID total mean (S.D.)	GRID external mean (S.D.)	GRID ward mean (S.D.)	GRID Patient Rooms Mean (S.D.)
United Kingdom												
1.	London (Newham)	178 (8.4)	33	COMM	Suburbs	PB	2	6.9 (2.3)	3.62	3.68	3.49	3.70
2.	London (Tower Hamlets)	111 (5.2)	33	GH	Central	PB	2	6.9 (2.3)	3.49	3.80	3.29	3.38
3.	London (Redbridge)	323 (15.2)	40	GH	Suburbs	PB	2	6.0 (2.7)	3.53	3.80	3.30	3.50
4.	Chelmsford	78 (3.7)	24	GH	Suburbs	PB	1	6.4 (2.4)	3.05	3.10	3.00	3.05
5.	Colchester	68 (3.2)	24	GH	Suburbs	PB	1	7.1 (1.9)	2.98	3.08	2.82	3.05
6.	Harlow (Derwent)	77 (3.6)	24	GH	Suburbs	PB	2	6.7 (2.5)	2.99	2.70	3.24	3.05
7.	Aylesbury (Whiteleaf)	99 (4.6)	51	COMM	Central	PB	2	6.7 (2.5)	4.08	4.45	3.86	3.95
8.	Oxford (Littlemore)	53 (2.5)	51	GH	Suburbs	PB	1	6.4 (2.4)	3.26	2.80	3.74	3.25
9.	Oxford (Warneford)	122 (5.7)	51	A	Suburbs	ADAPT	1	6.7 (2.1)	2.98	3.34	3.20	2.40
10.	North Manchester (Park House)	214 (10.0)	35	GH	Suburbs	PB	2	6.8 (2.5)	3.12	3.22	3.19	2.95
11.	Ashton-under-Lyne (Tameside)	107 (5.0)	29	GH	Suburbs	PB	2	7.5 (2.1)	3.63	3.06	3.49	4.13
	Total	1430 (67.1)	36	–	–	–	–	6.65 (2.46)	3.38 (0.3)	3.47 (0.4)	3.34 (0.2)	3.33 (0.4)
Italy												
1.	Verona (OCM)	90 (4.2)	43	GH	Central	PB	2	7.6 (2.1)	2.72	2.56	3.70	2.78
2.	Verona (Policlinico)	58 (2.7)	42	GH	Suburbs	ADAPT	3	7.8 (1.4)	3.25	3.45	2.84	3.20
3.	Treviso	187 (8.8)	77	GH	Suburbs	PB	2	7.3 (2.1)	3.41	3.09	3.10	3.60
4.	Bussolengo	103 (4.8)	64	GH	Suburbs	ADAPT	3	7.7 (2.1)	2.17	1.91	3.59	2.35
5.	Cittadella	77 (3.6)	73	GH	Central	ADAPT	1	7.7 (1.8)	3.31	3.82	2.25	3.20
6.	Vicenza	145 (6.8)	34	GH	Central	ADAPT	3	7.0 (2.4)	2.57	2.55	2.92	2.60
7.	Adria	40 (1.9)	44	GH	Suburbs	ADAPT	1	7.3 (2.2)	4.09	3.87	2.56	4.30
8.	Total	700 (32.9)	53	–	–	–	–	7.41 (2.09)	2.97 (0.5)	2.89 (0.6)	2.99 (0.5)	3.06 (0.5)
All sample												
		2130 (100)		–	–	–	–	6.90 (2.37)	3.25 (0.4)	3.28 (0.6)	3.22 (0.4)	3.24 (0.5)

[a]Data from the UK includes all admissions within the participating trust and data from Italy includes all admissions within the participating hospital.
[b]'A' (19th century asylum, renovated), 'COMM' (newly built community building), 'GH' (building within general hospital site).
[c]'PB' (purpose built), 'ADAPT' (Adaptation).
[d]'1' (ground floor), '2' (ground floor + first floor), '3' (ground floor + two floors).

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Table 2. General characteristics of wards included in the study

					Communal areas				Number of therapy spaces		
	Hospital	Ward typology[a]	Patient bedrooms[b]	Patient bathrooms	Lounge	Dining	Family room off ward	No. of communal rooms per ward	Individual	Group	Outside areas
1.	London (Newham)	Y	Single	En suite	+	+	+	6	3	1	Garden, Courtyard
2.	London (Tower Hamlets)	T	Single	En suite	+	+	+	6	4	1	Garden, Courtyard, Balcony
3.	London (Redbridge)	+	Single	En suite	+	+	+	4	2	1	Garden, Balcony
4.	Chelmsford	I	Mixed	Shared	+	+	+	5	2	3	Garden
5.	Colchester	L	Single	Shared	+	+	+	5	4	2	Garden
6.	Harlow (Derwent)	H	Mixed	Shared	+	+	–	5	2	1	Garden
7.	Aylesbury (Whiteleaf)	+	Single	En suite	+	+	–	6	3	2	Garden
8.	Oxford (Littlemore)	+	Single	Shared	+	+	+	5	2	2	Garden
9.	Oxford (Warneford)	L	Mixed	Shared	+	+	+	6	3	4	Garden
10.	North Manchester (Park House)	Mixed (L, I)	Mixed	Shared	+	+	+	4	2	2	Garden
11.	Ashton-under-Lyne (Tameside)	Mixed (T, Circle)	Single	En suite	+	+	+	5	2	2	Garden, Courtyard
12.	Verona (OCM)	I	Mixed	Shared	–	+	–	2	3	0	None
13.	Verona (Policlinco)	I	Mixed	Shared	+	+	–	2	1	0	None
14.	Treviso	H	Mixed	Shared	+	+	–	1	1	0	Garden, Balcony
15.	Bussolengo	L	Multi-bed	Shared	–	+	–	2	1	0	None
16.	Cittadella	T	Multi-bed	Shared	+	+	–	2	2	1	Garden
17.	Vicenza	C	Mixed	Shared	+	+	+	4	5	0	None
18.	Adria	L	Mixed	Shared	+	+	–	2	1	0	Garden, Balcony

[a]Letters and symbols denote the shape of ward floorplans, e.g. '+' denotes cruciform shape.
[b]Patient bedrooms were catagorised into single, multi-bed or mixed (wards offer both single and multi-bed room).

Table 3. Study participants characteristics

	All participants $N = 2130$ (100%)	UK sample $N = 1430$ (67.1 %)	Italian Sample $N = 700$ (32.9 %)	Statistics
Age, years[a] Mean (s.d.)	41.88 (s.d. 13.9)	39.1 (12.6)	47.7 (14.4)	$F = 199.6$, df = 1, $p < 0.0001$
Gender[b] *N* (%)				
Males	1186 (55.8)	855 (60.0)	331 (47.3)	$X^2 = 30.568$, df = 1, $p < 0.0001$
Females	940 (44.2)	571 (40.0)	369 (52.7)	
Education[c] *N* (%)				
Primary	236 (11.2)	169 (12.0)	67 (9.7)	$X^2 = 19.372$, df = 3, $p < 0.0001$
Secondary	791 (37.6)	507 (36.0)	284 (40.0)	
Further education	1010 (48.0)	702 (49.8)	308 (44.4)	
Other	67 (3.2)	32 (2.3)	35 (5.0)	
Marital status[d] *N* (%)				
Single	1.603 (76.0)	1136 (80.5)	467 (66.9)	$X^2 = 46.964$, df = 1, $p < 0.0001$
In a relationship	507 (24.0)	276 (19.5)	231 (33.1)	
Employment[e] *N* (%)				
Paid	494 (24.0)	315 (22.7)	180 (26.7)	$X^2 = 6.021$, df = 2 $p = 0.049$
Unpaid	1433 (69.6)	974 (70.3)	459 (68.2)	
Retired	131 (6.4)	97 (7.0)	34 (5.1)	
Primary diagnosis at admission *N* (%)				$X^2 = 11.523$, df = 1, $p = 0.001$
F2 spectrum	877 (41.2 %)	625 (43.7)	252 (36.0)	
Other	1253 (58.8)	805 (56.3)	448 (64.0)	
Voluntary admission[f] *N* (%)				
Yes	1445 (68.0 %)	807 (56.6)	638 (91.1)	$X^2 = 257.446$, df = 1, $p < 0.0001$
No	681 (32.0 %)	619 (43.4)	62 (8.9)	
Patient satisfaction with treatment – CAT[e] Mean (s.d.)	7.42 (8.41)	7.17 (8.36)	7.94 (8.51)	$F = 3.934$, df = 1, $p = 0.047$

[a]Data missing for 5 participants in the United Kingdom sample ($N = 1425$).
[b]Data missing for 4 participants in the United Kingdom sample ($N = 1426$).
[c]Data missing for 20 participants in the UK sample ($N = 1410$) and 6 participants in the Italian sample ($N = 694$).
[d]Data missing for 18 participants in the UK sample ($N = 1412$) and 2 participants in the Italian sample ($N = 698$).
[e]Data missing for 44 participants in the UK sample ($N = 1331$) and 27 participants in the Italian sample ($N = 673$).
[f]Data missing for 4 participants in the UK sample ($N = 1426$).

times. The number of individual therapy rooms varied from 1 to 5 (mean 2.4, s.d. 1.1), while the number of group therapy rooms varied from 0 (six hospitals, all in Italy) to 4 (mean 1.2, s.d. 1.1). The majority of wards offered a combination of single and multi-bed rooms ($n = 9$). Four Italian hospitals did not provide any outside areas, while in other hospitals, patients could access gardens/courtyards/balconies. In these four hospitals, patients were provided with indoors smoking rooms, as shown in Table 2.

Specific aspects of the hospital buildings

Study hospitals were characterised with small to medium size wards (mean number of patients per ward was 18.9, s.d. 3.7; range 9–26; min. number of staff per ward ranged from 2 to 7). In a majority of hospitals, entrance doors were locked ($n = 16$), alarm systems were available to patients ($n = 11$) and staff ($N = 18$) and ground-floor wards were provided with security fences ($n = 18$). In eight hospitals, all in the UK, patients were able to lock their bedrooms. The majority of hospitals ($n = 12$) offered mixed-sex wards, others offered single-sex wards (male or female wards). All hospitals accommodated patients in single-sex rooms. In three hospitals, all in the UK, smoking was not allowed on hospital premises. In other hospitals, smoking was allowed outdoors ($n = 11$) or in smoking rooms onwards ($n = 4$), as shown in Table 4.

Expert Observation Grid

The total scores of the Expert Observation Grid for each hospital as well as the three subscales, are shown in Table 1. The results varied across hospitals and there was a tendency for patient rooms to receive higher scores than other spaces on and off wards.

Patient satisfaction with treatment

The mean CAT score in the total sample was 7.90 (s.d. 2.37). The intra-class correlation coefficient was 0.03; there was some variance of hospital average CAT score Rankits present, but it was relatively low compared to the within-hospital variance. Nevertheless, we were interested to see if selected variables could predict some of this variance.

Table 4. Hospital characteristics specific for mental health care

	Hospital	Safety and security							Wards – patient sex[b]	Smoking[c]
		Max number of patients per ward	Min number of staffs per ward	Main ward entrance locked	Patient rooms locking	Alarm systems for patients[a]	Vision panels on patient bedroom doors	Fences and secure boundaries (ground floor wards)		
1.	London (Newham)	15	4	+	+	+	+	+	Mixed	Outdoors
2.	London (Tower Hamlets)	18	4	+	+	+	+	+	Mixed	Outdoors
3.	London (Redbridge)	24	4	+	–	–	+	+	Single	Outdoors
4.	Chelmsford	21	3	+	+	–	+	+	Single	Outdoors
5.	Colchester	18	3	+	+	+	+	+	Single	Outdoors
6.	Harlow (Derwent)	19	4	+	–	–	+	+	Single	Outdoors
7.	Aylesbury (Whiteleaf)	22	5	+	+	–	–	+	Single	Banned
8.	Oxford (Littlemore)	20	6	+	+	–	+	+	Mixed	Banned
9.	Oxford (Warneford)	18	4	+	+	–	+	+	Single	Banned
10.	North Manchester (Park House)	24	6	+	–	–	+	+	Mixed	Outdoors
11.	Ashton-under-Lyne (Tameside)	22	4	+	+	+	+	+	Mixed	Outdoors
12.	Verona (OCM)	14	4	+	–	+	–	+	Mixed	Indoors
13.	Verona (Policlinico)	15	4	+	–	+	–	+	Mixed	Indoors
14.	Treviso	16	7	–	–	+	–	–	Mixed	Outdoors
15.	Bussolengo	15	4	+	–	–	–	+	Mixed	Indoors
16.	Cittadella	15	5	+	–	+	–	+	Mixed	Outdoors
17.	Vicenza	15	5	+	–	+	–	+	Mixed	Indoors
18.	Adria	9	2	–	–	+	–	–	Mixed	Outdoors

[a]All hospitals have alarm systems available to staff.
[b]On mixed-sex wards patients of the opposite sex share the same space, this can include sharing sleeping accommodation, toilets or washing facilities.
[c]Smoking is banned or allowed outdoors (e.g. courtyards, smoking balconies) or indoors (e.g. smoking rooms).

Association of the hospital built environment with patients' treatment satisfaction

Table 5 shows that Model 1.2 fitted the data much better than the null model. There was a large decrease in the information criterion when Level-1 predictors were entered into the model. Level-1 predictors together explained 3% of Level-1 variance of CAT score Rankits. Females, patients with higher education, those who were admitted to the hospital non-voluntarily and younger patients were found to be less satisfied with the treatment (see Table 6). In univariate mixed-effect linear regression analysis (Models 2.1–2.12), a notable ΔAICC, i.e. reduction in the information criterion value, was observed with Models 2.2 and 2.6 (Table 5), and AICC was further reduced when Gender × Level-2 predictor interaction term was added to these models (see Models 2.2a and 2.6a). According to Burnham and colleagues, such ΔAICC can be considered to show that Model 1.2 was less plausible compared to these models (Burnham, Anderson, & Huyvaert, 2011).

In Model 2.2 and Model 2.6, mixed-sex wards and availability of family rooms off-ward were added to the model as a Level-2 predictor. Table 7 shows that these two elements of the hospital environment (availability of family rooms off-ward and mixed-sex wards) were statistically significantly associated with higher hospital average CAT score Rankit. Type of wards (mixed *v.* single-sex) explained 56% of the variance of random intercepts that was left unexplained after Level-1 predictors were entered into the model, and the presence of communal family rooms off ward explained 33% of random intercepts' variance. Other Level-2 predictors were not found to be statistically significantly related to hospital average CAT score Rankit when the models only contained main factor effects (Table 7), even though they explained a relatively large proportion (up to 30%) of the variance of these scores (Table 5). When an interaction between gender and the Level-2 predictor was also added to Models 2.2 and 2.6, some additional Level-2 variance was explained. Overall, females reported less satisfaction than males. Compared to males, where the effect of the type of wards and the existence of communal family rooms off ward was smaller, females reported higher satisfaction in the case of mixed wards than in case of the single ward and when there were no communal family rooms off wards in the hospital compared to hospitals having such rooms (Table 7).

Discussion

Main findings

The study identified two main aspects of the hospital built environment that were associated with a higher treatment satisfaction with psychiatric in-patient care: the availability of rooms to meet family members off wards and being hospitalised on a mixed-sex ward. Compared to male patients, females' treatment satisfaction seems to be affected more by these hospital characteristics.

Findings in the context of the literature

Communal areas such as lounges, dining rooms, and lobby areas are key social spaces in psychiatric facilities. They make it easier for patients to have casual interactions with others and to participate in therapeutic activities (Curtis et al., 2009; Johansson, Skärsäter, & Danielson, 2007; Wood et al., 2013). Our findings indicate that the availability of spaces to meet family members off wards leads to higher treatment satisfaction. Adult mental health services tend to focus on the individual patient with less consideration of family members, especially dependents of the patients. Yet, approximately 25–50% of all psychiatric in-patients have dependent children (Radcliffe & Smith, 2007). The international guidelines for mental health recommend that allocated space for families is provided off the wards to allow families, including minor age children, to visit patients whilst they are in hospital (Owen, 2008; Royal College of Psychiatrists, 2002). Family rooms have been described by patients as 'little home away from home, where I can spend time with my child and feel normal again' (Mbeah-Bankas, 2013). In this study, 10 out of 18 hospitals provided such space and could therefore be considered as a family-friendly facility. Isobel and colleagues have argued that establishing family rooms in in-patient settings are one of the first steps towards family-focused care in mental health services (Isobel, Foster, & Edwards, 2015). Somewhat unexpectedly, we found that female patients, compared to male patients, reported lower treatment satisfaction in hospitals with communal family rooms off wards. This finding might reflect reports in the literature that family rooms are often poorly managed in practice due to lack of policy and guidelines (Isobel et al., 2015; O'Brien, Anand, Brady, & Gillies, 2011a) and lack of staff trained to deliver family-focused care (O'Brien, Brady, Anand, & Gillies, 2011b). If this was true for the hospitals in this study, it might be possible that female patients were more sensitive to these issues compared to male patients.

Being hospitalised on a mixed-sex ward also appears to be associated with higher patient treatment satisfaction. Over the past two decades, most psychiatric wards in the UK have created separate wards or ward areas for male and female patients. Due to reports of sexual harassment and assault on mixed-sex wards, single-sex wards were put in place to preserve the dignity, safety, and privacy of patients (especially females). In Italy, all wards remain to be mixed-sex. This is due to the fact that according to the Italian Mental Health Law (Law n.180/1978), psychiatric in-patient care should be provided within small units located within general hospitals that cannot exceed the number of 15 beds (de Girolamo et al., 2007). Therefore, given the limited number of beds in each in-patient unit set by law, it is not feasible to define *a priori* gender-specific sections. All mixed-sex wards included in this study ($N = 11$) offered single-sex accommodation. Only exceptionally (e.g. in a clinical emergency), patients can be temporarily admitted to mixed-sex bedrooms. Our findings indicate that having other areas of the ward (e.g. lounge or dining room) with both men and women is associated with higher patient treatment satisfaction. It follows that patients value more natural environments that allow them to replicate contexts and social encounters from community life. There is limited evidence on which (single-sex or mixed-sex wards) is the better option for staff and patients; previous studies concluded that both options have their pros and cons (Leavey, Papageorgiou, & Papadopoulos, 2006; Mezey, Hassell, & Bartlett, 2005). Our findings contribute to this debate by suggesting that mixed-sex in-patient wards with single-sex accommodation are associated with higher patient treatment satisfaction, especially in female patients. We need to emphasise that both patient safety and treatment satisfaction need to be taken into consideration when making decisions about hospital design. The relationship between patient safety and satisfaction seems to be very complex. Leavey et al. (2006) showed that women in acute psychiatric wards favoured single-sex accommodation, however, patients suggested that diagnosis, the severity of illness and age are equally important in determining hospital accommodation and a safe, therapeutic

Table 5. The fit of mixed effect linear regression models for predicting the Rankit of CAT score and the estimates of Level-1 and Level-2 variances

			Level 2			
Model	AICC	ΔAICC	var	R^2	ΔR^2	Level-1 *var*
Null model	5910.91	114.81a	0.029195			0.924923
Models with Level-1 predictors						
Model 1.1	5797.62	1.51a	0.019459	0.33	0.33[b]	0.900003
Model 1.2	5796.11		0.019437	0.33	0.33[b]	0.900197
Models with Level 1 predictors and an additional Level-2 predictor						
Model 2.1	5797.31	−1.2				
Model 2.2	5789.28	6.83	0.008610	0.71	0.56	0.900096
Model 2.3	5795.71	0.4	0.013752	0.53	0.29	0.900004
Model 2.4	5797.38	−1.27	0.017858	0.39	0.08	0.900314
Model 2.5	5797.53	−1.42	0.019371	0.34	0.00	0.899958
Model 2.6	5792.68	3.43	0.012956	0.56	0.33	0.899847
Model 2.7	5796.36	−0.25	0.015321	0.48	0.21	0.899773
Model 2.8	5797.56	−1.45	0.018863	0.35	0.03	0.900110
Model 2.9	5794.00	2.11	0.017456	0.40	0.10	0.900156
Model 2.10	5794.72	1.39	0.016054	0.45	0.17	0.899704
Model 2.11	5796.50	−0.39	0.017099	0.41	0.12	0.900155
Model 2.12	5797.28	−1.17	0.018245	0.38	0.06	0.900208
Models with Level 1 predictors and an additional Level-2 predictor and its interaction with gender						
Model 2.2a	5781.89	14.73	0.008513	0.71	0.56	0.896112
Model 2.6a	5790.57	5.54	0.012706	0.56	0.35	0.898164

Note. Models 2.1–2.12 included Model 1.2 predictors and the following Level-2 predictor: Model 2.1 Hospital location (city, suburbs), Model 2.2 Type of wards (mixed sex, single sex), Model 2.3 Type of patient rooms (multi-bed, mixed, single-bed), Model 2.4 Type of bathroom (ensuite, shared), Model 2.5 Presence of safety privacy locks (no *v.* yes), Model 2.6 Presence of communal family rooms off ward (yes, no), Model 2.7 Smoking (outside, indoors, banned), Model 2.8 Number of rooms for individual therapy, Model 2.9 Number of rooms for group therapy, Model 2.10 Number of communal rooms, Model 2.11 Number of outside areas, Model 2.12 Expert Observation Grid – Total score. Models 2.2a and 2.6a also included an interaction between gender and the Level-2 predictor. AICC = Bias-corrected Akaike's information criterion (the Hurvich and Tsai's criterion). ΔAICC in Models 2.1–2.12 was calculated as the difference between AICC for Model 1.2 and AICC for the tested model. ΔR^2 in Models 2.1–2.12(a) have been calculated as proportion of reduction in error variance compared to the Model 1.2 error variance.
aΔAICC was calculated as the difference between AICC for the tested model and AICC for Model 1.2.
bΔR2 was calculated as a proportion reduction in the level variance compared to the null model.

environment. The same study explored staff perspectives and found that male staff was concerned with potential allegations of sexual harassment, while women staff view single-sex accommodation as a threat to creating a more natural environment for patients (Leavey et al., 2006). To conclude, patient safety on psychiatric wards may not be wholly resolved by the introduction of single-sex wards/accommodation and other measures should be considered such as full assessment of patient safety within the psychiatric setting, clear policy guidelines, staff training etc. (Leavey et al., 2006; Mezey et al., 2005).

Strengths and limitations

As the largest study to date that explores the role of the built environment in the satisfactory treatment of psychiatric in-patients, our findings can impact understanding and improving clinically important outcomes of in-patient care. Through a quasi-experimental design, the present study acknowledges that the built hospital environment can be assumed to have influenced patients' treatment satisfaction since patient allocation to hospitals was strictly determined by geography and not influenced by patients' characteristics or preferences. Since patient characteristics can be strongly associated with treatment satisfaction, our model to predict the treatment satisfaction scores were adjusted for patient characteristics. A further strength is that the study assessed actual satisfaction with treatment rather than satisfaction with the architecture of the building, which is an important consideration for building hospitals, but is not necessarily clinically relevant. The study also had several limitations. It used a convenient sample of hospitals, and it is possible that the managers of particularly poorly designed facilities did not participate in the study. The sample of patients may have been selective and included individuals with better education (e.g. 48% of the patient population started/completed education beyond secondary school). Also, very dissatisfied patients may have more often declined to be interviewed, thus reducing the variance of treatment satisfaction in the analysis. However, whilst these potential selection biases of hospitals and patients may have influenced the absolute distribution of hospital aspects and scores of treatment satisfaction (e.g. how satisfied patients were), our associations – and the association between aspects of the built environment and patients' treatment satisfaction was the research question in our study – are commonly assumed to be less influenced by such selection biases. Lastly, there is limited availability of instruments with sound psychometric properties in this field (Elf, Nordin, Wijk, & Mckee, 2017) and although the Expert

Table 6. Parameter estimates in different models with Level-1 predictors only

Predictors	*b*	SE_b	df	*T*	*p*	95% CI for *b*
Model 1.1						
Intercept	0.09	0.06	93.4	1.58	0.118	[−0.02, 0.21]
Gender (female)	−0.09	0.04	2107.9	−2.13	0.034	[−0.17, −0.01]
Education (secondary or less)	0.09	0.04	2107.7	2.10	0.036	[0.01, 0.17]
Non-voluntary admission	−0.28	0.05	1680.5	−5.88	<0.001	[−0.38, −0.19]
Psychosis at admission	0.03	0.04	2107.8	0.66	0.508	[−0.06, 0.12]
Age at interview	0.09	0.02	2094.3	4.31	<0.001	[0.05, 0.13]
Model 1.2						
Intercept	0.11	0.05	58.6	2.14	0.037	[0.01, 0.22]
Gender (female)	−0.09	0.04	2108.0	−2.06	0.040	[−0.17, −0.00]
Education (secondary or lower)	0.09	0.04	2107.8	2.05	0.041	[0.00, 0.17]
Non-voluntary admission	−0.29	0.05	1648.9	−6.02	<0.001	[−0.38, −0.19]
Age at interview	0.09	0.02	2094.0	4.43	<0.001	[0.05, 0.13]

Note. Age at interview was standardised within groups (hospitals).

Table 7. Parameter estimates in different models with Level-1 predictors from Model 1.2 and a single Level-2 predictor added

Model	Level-2 predictors	*b*	SE_b	df	*T*	*p*	95% CI for *b*
2.1	Hospital location (in the city)	0.08	0.08	21.1	0.92	0.370	[−0.10, 0.25]
2.2	Mixed sex wards	0.23	0.07	19.6	3.45	0.003	[0.09, 0.37]
2.2a	Gender (female)	−0.26	0.07	2106.7	−3.65	<0.001	[−0.39, −0.12]
	Mixed sex wards	0.11	0.08	36.0	1.44	0.159	[−0.05, 0.26]
	Mixed sex wards × gender (female)	0.27	0.09	2107.4	3.07	0.002	[0.10, 0.44]
2.3	Type of patient rooms (reference = single- and multi-bed rooms), $F(2, 22.0) = 2.50$, $p = 0.105$						
	Single-bed rooms	−0.07	0.08	20.4	−0.96	0.348	[−0.23, 0.09]
	Multi-bed rooms	0.20	0.12	23.4	1.69	0.105	[−0.05, 0.45]
2.4	Bathroom ensuite	−0.07	0.08	17,6	−0.88	0.389	[−0.25, 0.10]
2.5	No safety privacy locks	0.06	0.08	21.7	0.77	0.448	[−0.11, 0.23]
2.6	Communal family rooms off ward	0.18	0.07	23.0	2.50	0.020	[0.03, 0.33]
2.6a	Gender (female)	−0.15	0.05	2104.9	−2.92	0.004	[−0.26, −0.05]
	No communal family rooms off ward	0.10	0.08	41.2	1.16	0.254	[−0.07, 0.26]
	Gender (female) × No communal family rooms off ward	0.18	0.09	2108.0	2.03	0.042	[0.01, 0.35]
2.7	Smoking (reference = banned), $F(2, 24.3) = 2.03$, $p = 0.153$						
	Smoking outside allowed	0.02	0.11	24.7	0.19	0.855	[−0.20, 0.24]
	Smoking indoors allowed	0.20	0.13	26.6	1.58	0.126	[−0.06, 0.46]
2.8	Number of rooms for individual therapy	−0.03	0.04	20.2	−0.76	0.459	[−0.10, 0.05]
2.9	Number of rooms for group therapy	−0.05	0.04	22.6	−1.55	0.135	[−0.13, 0.02]
2.10	Number of communal rooms	−0.04	0.02	23.9	−1.89	0.070	[−0.09, 0.00]
2.11	Number of outside areas	−0.06	0.05	19.9	−1.31	0.206	[−0.15, 0.04]
2.12	Expert Observation Grid – Total score	−0.07	0.08	21.4	−0.87	0.394	[−0.25, 0.10]

Note. As parameter estimates for Level-1 predictors in the listed models did not change much from those shown for Model 1.2 in Table 6, Table 7 only shows the estimates for the Level-2 predictor entered in the model, except for models where gender was entered into an interaction term.

Observation Grid is a comprehensive and theoretically well-grounded tool with good validity and good test–retest reliability, its adaptation to psychiatric settings requires further psychometric evaluation. Despite these limitations, the study adds to the literature on the hospital built environment by identifying spaces that need to be considered when planning psychiatric facilities.

Implications for practice and research

Hospitals are among the most expensive facilities to build and their design should be guided by evidence-based research. This study provides evidence that family rooms off wards and mixed-sex communal areas can potentially increase treatment satisfaction. These aspects of the design are likely to have an actual impact on patients' treatment satisfaction, possibly mediated through more supportive interactions with other patients, staff and families. We believe these findings have clear and strong implications on policies and practice. As all interventions in medicine should be evidence-based, psychiatric hospitals should also be designed using evidence-based interventions. Clinicians, patient groups, architects, funders, policy-makers and other relevant stakeholders should consider the evidence of this study when designing new psychiatric in-patient facilities or renovating the existing ones to ensure high levels of patients' satisfaction with treatment. Future research should be used to assess the mediating processes in more depth and explore the impact of design and implementation on communal spaces and rooms for meeting family members. Future research should also focus on further exploration of the complex relationship between patient safety, treatment satisfaction and hospital design.

Data availability

The data sets analysed during this study are available upon reasonable request from the study team.

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Author contributions. NJ and SP designed the study. NJ and SP coordinated hospital visits in the UK. EM and AL coordinated hospital visits in Italy. AP designed data analysis strategy and analysed data. NJ, MAM, JC and EM were involved in adapting study instruments and in assessing hospital built environment. NJ drafted the manuscript. All authors contributed to writing of the report and approved the final version before submission.

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