# How to design psychiatric facilities to foster positive social interaction – A systematic review

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ABSTRACT

Psychiatric facilities are often criticised of being poorly designed which may contribute to violent incidents and patients' complaints of feeling bored and lacking meaningful interactions with peers and staff. There is a lack of understanding how to design environments for staff, patients and visitors to engage in positive social interactions (e.g. conversation, sharing, peer support). We conducted a systematic literature review on which architectural typologies and design solutions facilitate helpful social interactions between users of psychiatric facilities. Several interventions were identified such as choosing a community location; building smaller (up to 20 beds) homelike and well integrated facilities with single/double bedrooms and wide range of communal areas; provision of open nursing stations; ensuring good balance between private and shared spaces for patients and staff; and specific interior design interventions such as arranging furniture in small, flexible groupings, introduction of plants on wards, and installing private conversation booths. These interventions range from simple and non-costly to very complex ones. The evidence should inform the design of new hospitals and the retrofitting of existing ones.

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## 1. Introduction

The design of psychiatric facilities has always reflected dominant social views about mental illness. The de-institutionalisation of services in the 1960s has shifted the purpose of psychiatric treatment from containment to recovery, thus proposing the transition from traditional hospital-based care to care focused on supporting and maintaining patients within their homes and communities [1]. Within this shift, psychiatric in-patient services should have abandoned the culture of paternalism and embraced the new way of working which allows patients to make informed decisions about their care and treatment, in partnership with their health and social care practitioners. One of the tasks of psychiatric treatment should be to create a safe environment for people to try out positive social interactions (e.g. sharing, peer support, and positive feedback) [2]. However, psychiatric facilities are still criticised for being designed as

custodial and repressive [3,4]. Patients treated in psychiatric facilities have repeatedly complained of experiencing negative interactions (e.g. violence), boredom, and of a lack of meaningful interactions with peers, staff and family members [5–8].

Increasingly, the architecture of psychiatric facilities, including the internal and external environments has been shown to influence the way in which healthcare is delivered. The healthcare delivery is also influenced by other factors such as cultural attitudes and assumptions of the wider society within which the facility is located as well as 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 [8]. Just as psychiatry has moved toward an evidence-based approach, so too should the design of psychiatric facilities be informed by the best available evidence in order to demonstrate improvements in clinical outcomes, economic performance, and users' satisfaction [9–11]. However, the link between psychiatric facilities and clinical outcomes of patients can be very complex. A model is therefore required to search and understand the evidence. The theoretical framework for this study is based on Ulrich's theory of supportive design [12]. According to this theory, the hospital environment will reduce stress in patients if it provides opportunities for social interaction, fosters patients' perceptions

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of control and autonomy, and creates positive distractions. With regard to social interaction, both the receipt and provision of social support have been found to have beneficial effects. For example, family presence in healthcare settings or genuine peer support is believed to enhance health outcomes and the patient experience. There is strong evidence from early studies conducted during 1970s and 1980s that levels of social interaction can be increased—and presumably beneficial social support as well—by providing communal areas with comfortable movable furniture arranged in small flexible groupings. These studies have largely been conducted in psychiatric units and nursing homes [11]. In this review we wanted to further explore more recent literature in this field. One may assume that buildings can foster or hinder relevant interactions between users which may then influence outcomes, so that positive social interaction can be taken as a key behavioural criterion to assess the role of architecture. We therefore conducted a systematic review of the existing evidence on the relationship between design and social interactions between different users of psychiatric facilities. Since such evidence cannot always be based on randomised-controlled trials, a wider approach with a narrative synthesis has been taken. We used 'psychiatric facility' as a general term for psychiatric in-patient facilities and residential community facilities used by psychiatric patients.

## 2. Methods

The review followed the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) statement [13]. The protocol was published on PROSPERO on 1 June 2015 (https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=22074). Six electronic databases (PubMed, EMBASE, PsycINFO, CINAHL, Scopus, Web of Science) were searched from their inception to December 2018. The search words included 'psychiatric hospitals' [MeSH], 'psychiatric ward', 'psychiatric facility', 'built environment' [MeSH], 'architecture' [MeSH], 'design', 'social interaction', 'interpersonal relationships'[MeSH], and 'social support'. The reference lists of all included articles were hand searched for potentially relevant articles.

### 2.1. Eligibility criteria

Studies were included if a) conducted in psychiatric facilities with adults (age 18–65), b) reported at least one measure/description of design, and c) reported at least one measure of social interactions. No restriction was placed on location, language, or year of publication. The measures of design were related to urban planning and architecture (e.g. site/location and relatively permanent characteristics such as spatial layout of a hospital, room size, window placement), interior design (e.g. less permanent elements such as furnishings, colours, artwork), and ambient features (e.g. lightning, noise levels, temperature, and odours) [14]. Social interaction was defined as a process whereby people engage one another in mutually responsive ways. Because the terminology is inconsistent, we used the following descriptors: social interaction, social support, communication, social relationships, personal relationships, social capital, and family support. Studies that reported on structural (frequency or size) and/or functional (quality) dimensions of social interaction were included. We included studies reporting on positive (e.g. staff-patient conversations) and/or negative interactions (e.g. violent incidents).

### 2.2. Study selection, data extraction and quality assessment

All potential studies were exported into reference management software. After removing duplicates, the first author (NJ) screened all titles and abstracts while the other author (JC) screened a random selection of 20% of titles and abstracts to ensure the consistency. If there was any ambiguity on the eligibility of the study, the full paper was reviewed between the two authors (NJ and JC). Inter-reviewer agreement was 90%. The full text of articles
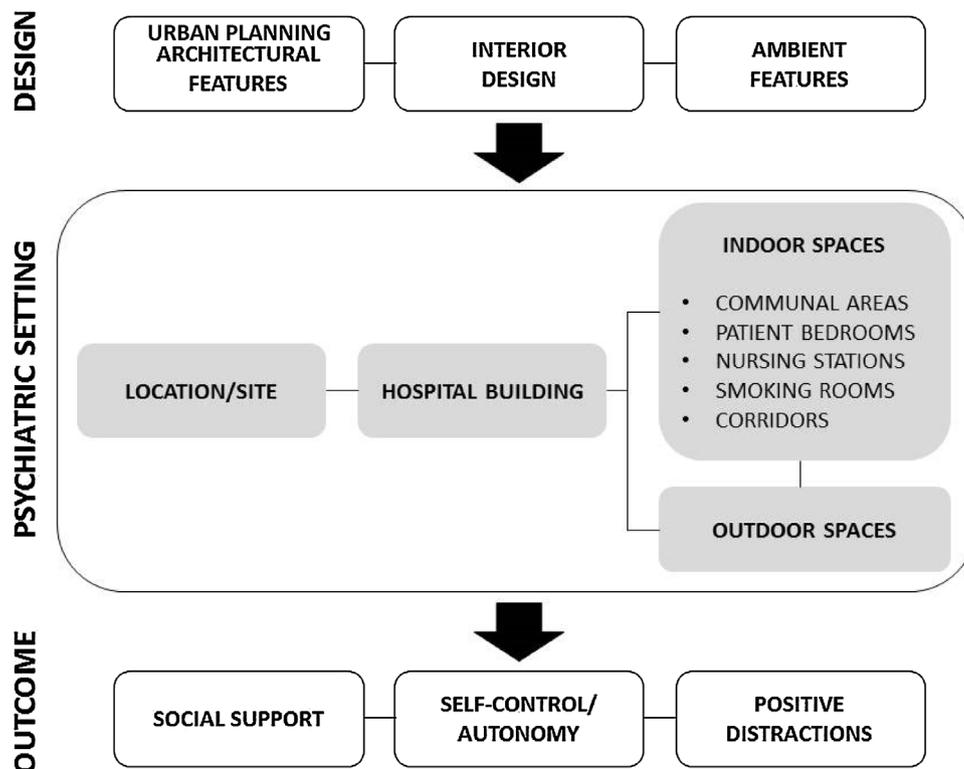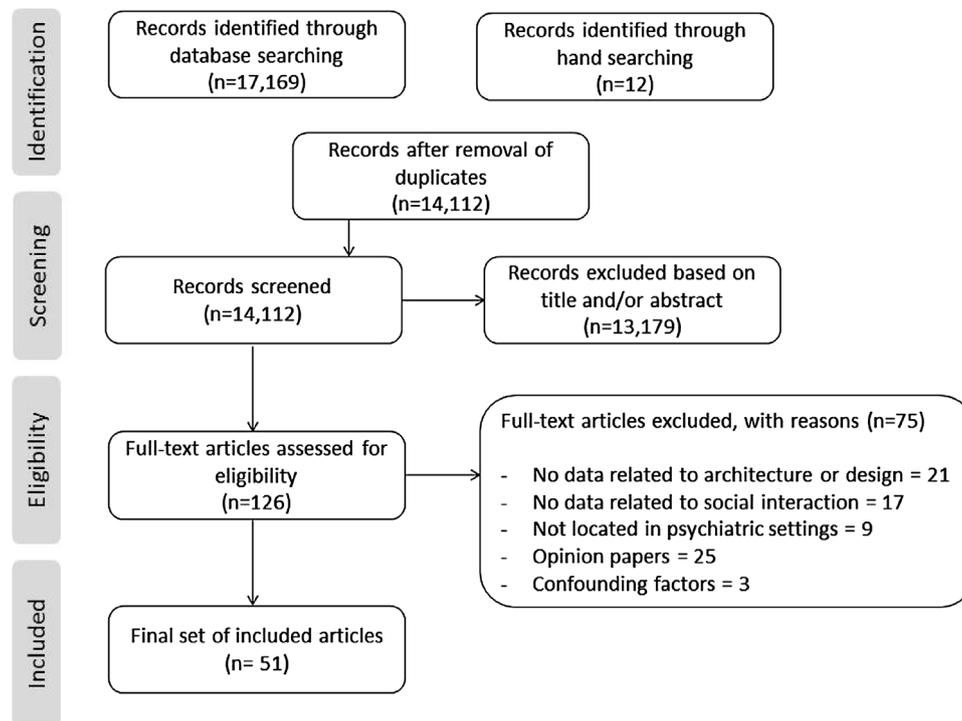


**Fig. 1.** Theoretical framework.

**Fig. 2.** Study selection.

meeting the criteria were obtained and reviewed. Reasons for exclusion were recorded. Data extraction was completed independently by two reviewers (NJ and JC). Data were extracted on study methodology, patient characteristics, design characteristics, and social interaction. Study quality was assessed using The Quality Assessment Tool for Quantitative Studies [15] and the RATS for qualitative studies [16]. The Quality Assessment Tool for Quantitative Studies leads to an overall methodological rating of strong, moderate, or weak in eight sections: selection bias; study design; confounders; blinding; data collection methods; withdrawals and dropouts; intervention integrity; and analysis. The RATS has been used to assess four key areas such as relevance of study question; appropriateness of qualitative method; transparency of procedures; and soundness of interpretive approach.

### 2.3. Data analysis

Narrative synthesis was used to analyse the data, which included four components: theory development, preliminary synthesis, exploring relationships within and between studies, and assessing robustness of synthesis [17]. These elements were undertaken sequentially in an iterative process throughout the review cycle. The theoretical framework includes design interventions (urban planning/architectural/interior design/ambient features) applied at different levels (e.g. from choosing the right building location to designing interior and exterior spaces) in order to create a functional and socially supportive facility [12,14,18,19]. Please see Fig. 1.

Tabulation and grouping data were used to create a preliminary synthesis of how the hospital design encourages social interactions between patients, staff, and visitors. The initial synthesis was largely based on data from randomised-controlled and case-controlled studies. The synthesis was shared among the study authors for discussion and refinement [17].

### 3. Results

The selection procedure is displayed in Fig. 2. The final selection consists of 51 studies including 33 interventional studies in which interventions ranged from moving into a new facility (N = 15) to ward redesign (N = 10) to room(s) redesign (N = 8). Three interventional studies were randomised-controlled trials and others used pre-post evaluation. The rest of the included studies were observational in nature (N = 18), conducted in a single setting (N = 6) or across two or more settings (N = 12). Three studies were reported in two separate papers and one study was reported in three separate papers. The studies were published between 1968–2018, deriving from eight countries: United States (N = 21), United Kingdom (N = 14), Canada (N = 5), Australia (N = 4), Sweden (N = 2), Norway (N = 1), Germany (N = 2), and Netherland (N = 2). Details are listed in Table 1.

### 3.1. Location of psychiatric facilities

Building psychiatric facilities within local communities rather than in isolated locations has three main advantages: it encourages patients to spend more time in the community [20–23], enables families to regularly visit patients, and reduces stigma [24,25]. Two studies have shown that once barriers of distance are removed, most psychiatric patients used ordinary community resources for their needs [21,24]. That in itself was not enough to enable patients to make new friends or renew family relationships. The architectural interventions, such as physical overlapping or integration of territories identified with various categories of users can facilitate their interactions [20]. For example, public areas can be included in the care spaces with amenities and equipment that can also be used by local residents [5,20,26].

**Table 1**
Study characteristics, level of design intervention, psychiatric setting and outcomes.

| Publication | Country | Type of study | Participants | Design intervention | Psychiatric facility | Outcome | Quality rating |
|---|---|---|---|---|---|---|---|
| **QUANTITATIVE STUDIES** | | | | | | | |
| **Randomised controlled studies** | | | | | | | |
| Holahan (1972) | USA | Randomized-controlled study | 120 male psychiatric inpatients | Interior design | Communal area | Sociopetal (chairs arranged around two small tables in the middle of the room) and mixed settings were significantly more social than the sociofugal (chairs arranged shoulder to shoulder along the walls of the room) and free settings. | Moderate |
| Holahan & Saegert (1973), Holahan (1976) | USA | Randomized-controlled study | 50 psychiatric inpatients, mixed gender, 50% with psychosis | Interior design | Inpatient ward | The remodelled ward (repainted, new furniture and changes to increase a range of social options: six-foot-high partitions, two-bed sections in each dormitory, a table and two comfortable chairs in each bedroom to allow for private conversation) was characterized by increased interaction among patients, staff, and visitors and decreased isolated passive behaviour. The arrangement of new tables and chairs in one dayroom encouraged small group interaction while a second dayroom's arrangement facilitated watching TV or playing games. Larger group socializing occurred at large tables in the dining room. No difference was found in isolated active behaviour (walking, reading). | Moderate |
| Davidson (1996) | USA | Randomized-controlled study | 35 patients, 4 staff | Interior design | Inpatient unit Community facility | The inpatient setting offered more social and recreational aids which encouraged more social activity within the unit. However, the patients in the community facility were more socially active outside the facility. | Moderate |
| **Non-randomised controlled studies** | | | | | | | |
| Wykes (1982) | UK | Observational study with controlled group | 25 long-stay psychiatric patients | Architectural features Interior design | Community facility | The design of a hospital-ward (traditional institutional designs, large living areas) had less social activities than the design of a hostel-ward (homelike features, living areas, double bedrooms, bright colours, good quality furniture, and the ability for patients to decorate their rooms). | Moderate |
| Whitehead (1984) | USA | Experimental, case-control study | 30 male and female psychiatric inpatients | Architectural features Interior design | Inpatient ward Nursing station | The redesigned ward increased social interaction via breaks up long institutional corridors subdivides dormitories, improves access to visiting room, adds flexibility of use to group and day rooms, opens the nursing station and accentuates practical purposes and humanistic values through colour and graphics and attractive furnishings. There was no significant impact on length of stay in the new ward. | Moderate |
| Christenfeld (1989) | USA | Pre-post renovation controlled study | 81 patients with schizophrenia, 71 staff | Interior design | Inpatient ward | Adding a series of waist-high walls throughout a ward's large dayroom promoted conversations and allowed places where a patient can be alone. The rate of patient violence decreased almost 50%. No improvement in perceived social isolation was detected. | Moderate |
| Devlin (1992) | USA | Pre-post renovation controlled study | 82 inpatients, 83 staff | Interior design Ambient eatures | Inpatient wards | New furnishings and the introduction of plants improved staff assessment of the environment and reduced patients' stereotypy. The most uniformly positive addition to the wards was the plants, and the major comment was that even more were needed. Changes in paint, colour, and lightning had no effect. | Moderate |
| Eggert (2014) Dvoskin (2002) | USA | Pre-post occupation controlled study | 526 forensic inpatients, 353 staff | Architectural features | Outdoor space | The addition of small quiet gathering spaces in each of the residential wings, open-air courtyards, and day halls with notably more floor space and abundant natural light allowed the patients more room to separate themselves from problematic interactions. These additional choices increased perceptions of safety, cohesion and mutual social support. The number of seclusions and restraint | Moderate |

**Table 1** (Continued)

| Publication | Country | Type of study | Participants | Design intervention | Psychiatric facility | Outcome | Quality rating |
|---|---|---|---|---|---|---|---|
| Ulrich (2018) | Sweden | Pre-post relocation controlled study | 42 psychiatric patients | Architectural features Interior design | Inpatient ward | episodes and patient-to-patient and patient-to-staff assaults found no change. Compared to the old hospital, the new wards were characterised with lower social density (number of person per room) and more stress-reducing features (e.g. more single bedrooms with private bathrooms, communal areas with movable seating, noise reduction design, design to foster control in patient rooms, garden accessible to patient, design for higher daylight exposure, and communal spaces and bedroom doors observable from central area). The proportion of patients requiring compulsory injections declined in the new hospital compared to the old facility but did not change in the control hospital. | Moderate |
| **Prospective cohort studies** | | | | | | | |
| Edwards & Hults (1970) | USA | Pre-post intervention | 80 male psychiatric inpatients (75% with long-termschizophrenia) and 21 staff | Interior design | Nursing stations | After the removal of the window glass of nursing stations staff spent less time in the office and more in the dayroom interacting with patients, patients visited the nursing station less often, the number of patients initiated interactions increased significantly, and indirect nonverbal communication between staff and patients changed to direct, verbal communication. Altogether 84% of staff and 88% of patients preferred open nursing station. The intervention decreased ideas of reference among patients. | Moderate |
| Baldwin (1985) | UK | Experimental, case-control | 200 psychiatric inpatients and 60 staff | Interior design | Inpatient ward Communal area | Ward furniture arranged into three or more chairs facing a table with games and books placed on tables improved the social interaction of patients. Non-significant decrease in violence and seclusion rates. | Moderate |
| Corey (1986) | USA | Pre-post renovation | 66 psychiatric inpatients and 65 staff | Interior design | Inpatient ward | The renovation (enlarged colour scheme, wall pictures, new furniture in a conversational arrangement, individual bedside dressers and bookshelves) did not change perceived social support on psychiatric wards. | Moderate |
| Muller (1996) | Germany | Pre-post renovation | 55 female psychiatric inpatients | Architectural features Interior design | Inpatient ward Communal areas | A smaller number of patients per room, better furniture, and more than one communal room increased the number of patients coming to the dayroom (35% vs. 64%), but they engaged significantly less in conversations with each other (46% vs. 16 %). | Moderate |
| Tyson (2002) | Australia | Pre-post renovation | 80 staff | Architectural features | Inpatient ward Communal areas Nursing station | The addition of the new wards with multibed rooms, shared spaces that included a fully utilised dining room, sitting/TV room, activity room, and external area with outdoor furniture increased positive staff-patients interactions as opposed to the old wards. New wards provided more private areas for nurses and more space for one-to-one interactions was beneficial as nurses spent less time in nursing stations. | Moderate |
| Olver (2009) | Australia | Pre-post relocation | 15 patients, mostly male with schizophrenia and schizoaffective disorder | Architectural features Interior design Ambient features | Inpatient, secure, long-stay facility | After the move from a temporary, refurbished medical ward to a large, light-filled, purpose-built facility, there was a significant reduction in the number of seclusion episodes. In the new facility, patients were transferred from four patients per bedroom to individual bedrooms and there were large expansions in indoor and outdoor recreational areas. There were statistically significant increases in ambient light conditions in the new unit. | Moderate |
| Borckardt (2011) | USA | Pre-post intervention | 5 inpatient units at one psychiatric hospital, 3 adult units, 1 geriatric and 1 child and adolescent unit | Interior design | Inpatient ward | Inexpensive physical changes (e.g. repainting walls with warm colours, placement of decorative throw rugs and plants, rearrangement of furniture to | Moderate |

**Table 1** (Continued)

| Publication | Country | Type of study | Participants | Design intervention | Psychiatric facility | Outcome | Quality rating |
|---|---|---|---|---|---|---|---|
| | | | | | | facilitate increased patient-patient and patient-staff interaction, replacing worn-out furniture) were associated with significant reduction in rate of seclusion and restraint. | |
| Long (2011) | UK | Pre-post relocation study | 9 forensic patients with personality disorder and schizoaffective disorder, 16 staff. | Architectural features | Inpatient unit | The move from an old Victorian hospital to new, purpose built facility led to no difference in perceived social support among users. In contrast to the old ward, the new unit has an increased amount of space per head, an enclosed courtyard with flowerbeds and running water, large communal area, en suite toilet facilities, food freshly prepared on site and a view from each bedroom of nature. | Moderate |
| Urbanoski (2013) | Canada | Pre-post renovation | 290 patients with mood and anxiety disorders | Architectural features | Inpatient ward | Compared to the old ward (traditional design), patients on the renovated ward (patient-centred design, private en-suite rooms, central common room, private visitation rooms, and a kitchen area) perceived a more positive atmosphere regarding greater peer support and autonomy and more emphasis on practical skill development. | Moderate |
| van der Schaaf (2013) | Netherlands | Observational study | 16 psychiatric hospitals, 199 wards, intensive care, 14834 patients | Architectural features Interior design | Inpatient ward | Architectural features such as more total private space per patient, a higher level of comfort and greater visibility on the ward decreased the risk of being secluded. | Moderate |
| Jenkins (2014) | UK | Pre-post relocation | 18 patients, mostly male, F2 spectrum | Architectural features | Inpatient ward, intensive care unit | The move from an old, temporary building to a new, purpose-built ward led to decrease in aggressive incidents and seclusion. This was associated with greater space on the new ward which enabled more privacy and better visibility. | Moderate |
| Dressler (2015) | Germany | Pre-post relocation | 18 psychiatric inpatients | Architectural features Interior design | Inpatient ward | The new building had substantially increased ward space, changed room settings (from mainly 2-4 bed rooms to only 2- and 1-bed rooms), improved sanitary arrangement, more natural lighting, modern home electronics and large balconies. Service organisation remained almost the same. Significant reduction in seclusion and physical or mechanical restraint in the new building. | Moderate |
| Nicholls (2015) | Australia | Pre-post relocation | 100 psychiatric acute inpatients, 92 staff | Architectural features | Communal areas | After the move from old (cramped, dark, few usable outdoor areas, minimal therapy, and social spaces, shared bedroom and bathroom facilities) to the new facility (purpose-built, individual en-suite bedrooms, recreational courtyards, increased social and therapy space) patients perceived themselves as being more socially active and energetic. | Moderate |
| **Cross-sectional studies** | | | | | | | |
| Sommer & Gilliland (1961) | Canada | Observational | Patients and staff from psychiatric hospital for 1500 patients and 500 staff | Architectural features | Inpatient wards Corridors | Five times as many patients were occupied constructively in the dayroom than in the corridor or outside hallway. Patients who sat in the outside corridor tended to isolate themselves. They tended to report not having friends (56% compared to 31% in day room). | Moderate |
| Srivastava & Good (1968) | USA | Observational comparative study | 105 psychiatric patients | Architectural features Interior design | Inpatient wards | The wards in the nineteenth century building varied in structural characteristics (e.g., design complexity; open/glass-enclosed nursing stations; location, design, and equipment of communal areas). The open nursing station areas were focal points of interaction. Occupational therapy rooms were favourite spots for large groups. The location of communal areas at opposite ends contributed to the decentralisation of groups and activation of connecting corridors. Groups commonly tended to form near windows and congregated around low partitions | Moderate |

**Table 1** (*Continued*)

| Publication | Country | Type of study | Participants | Design intervention | Psychiatric facility | Outcome | Quality rating |
|---|---|---|---|---|---|---|---|
| | | | | | | (≤1,2 m) which were also influenced by seating arrangements. | |
| Ittelson (1970) | USA | Observational comparative study | 75 acute psychiatric inpatients, 40 long-term patients | Architectural features Interior design | Psychiatric hospital Communal areas Patients' bedrooms | Single or double rooms are characterised with more social activity. Dormitory rooms are characterised with more isolated passive behaviour (e.g. lying on a bed) and lower occupancy rates. Women found to require more privacy. | Moderate |
| Fairbanks (1977) | USA | Observational | Total number of patients and staff ranged from 1,115 to 1,274 | Architectural features Interior design | Inpatient wards Communal areas | The addition of social areas increased social interaction in these areas, but at the expense of a decrease in interaction in other rooms, thus resulting in no significant difference between the two wards in the total frequency of social behaviour. | Moderate |
| Polsky & Chance (1980) | UK | Experimental | 24 male inpatients with long-term schizophrenia, 8 staff | Interior design | Communal areas | The physical appearance of the ward was pleasant but conservative. Patients who interacted the most tended to sit in the areas closest to the front of the ward (entrance, nursing station, toilets, kitchenette, and access to other parts of the ward). Middle interactors preferred the areas furthest from the front. The back parts of the wards encouraged socially withdrawn patients to avoid social interaction. | Moderate |
| Rice (1980) | USA | Experimental | 14 inpatients with long-term schizophrenia | Interior design | Dining rooms | The introduction of flowers into dining rooms on wards was followed by an increase in social gazing, time spent in the dining room, and food consumed. The introduction of wine bottles led to a significant increase in vocalisations, social gazing, time spent in the dining rooms, and quantity of food consumed. | Moderate |
| Collins (1985) | USA | Observational | 7,971 male psychiatric inpatients | Interior design | Inpatient wards Communal areas | The presence of current magazines on psychiatric wards was an indicator of patients' social activity. Furniture grouped in circles in front of TV was an indicator of passive social behaviour and poor therapeutic outcome. | Moderate |
| Gibbons & Butler (1987) | UK | Observational | 15 psychiatric patients, | Architectural features Interior design | Community facility | The move from hospital to hostel led to patients spending significantly less time doing nothing (27% vs. 52,5%), more time talking (18% vs. 34%) and interacting with visitors (6% vs. 10%). The hostel residents visited the community more, and made more use of its resources, but subjectively the majority felt lonely and cut off, and those who lacked contact with relatives and friends did not increase it after moving. | Moderate |
| Shepherd (1996) | UK | Observational comparative | Residents and staff (numbers not given) from 5 rehabilitation wards and 20 community homes | Architectural features | Inpatient ward Community facility | The most disabled patients were in hospitals in poor physical environment and receiving the poorest quality of care. In hospitals significantly less patient-staff interactions over 8 hours were observed than in community settings (mean 4.9, SD 2.4 vs mean 11.1, SD 4.7). Both staff and residents contributed equally to the production of positive and negative interactions, and the highest rates of negative interactions were seen in hospitals with the most disabled patients and the longest serving staff. | Moderate |
| Nijman (1999) | Netherlands | Observational comparative study | 354 patients with substance misuse, mood, psychotic and personality disorders | Architectural features | Inpatient ward, outside areas | Aggressive incidents were documented on two locked wards, ward crowding was modestly positively correlated with the number of aggressive incidents. Enlargement of the physical space by the addition of a courtyard did not reduce aggressive incidents. | Moderate |
| McGonagle (2002) | UK | Observational comparative study | 27 patients with residual schizophrenia | Architectural features Interior design | Community facility | After two years, patients moved to purpose-built community bungalows (design reflects a house dwelling, clean and modern furnishings, the nursing philosophy promotes the non-institutional practice and greater social contact with the community) showed a significantly lower | Moderate |

**Table 1** (*Continued*)

| Publication | Country | Type of study | Participants | Design intervention | Psychiatric facility | Outcome | Quality rating |
|---|---|---|---|---|---|---|---|
| | | | | | | level of social, behavioral problems than patients on wards (institutional design and approach). | |
| Bola & Mosher (2003) | USA | Quasi-experimental | 179 patients with schizophrenia | Architectural features | Community facility | Small, homelike, interpersonally focused therapeutic milieu with non-professional staff led to large effect size benefit in domains of psychopathology, work, and social functioning. | Moderate |
| Southard (2012) | USA | Experimental | 81 acute inpatients with mood/ anxiety/substance use disorders, 25 nurses | Interior design | Nursing station | The removal of the glass from the nursing station had no statistically significant difference in patient or staff perceptions of social involvement or social support in staff-patient interactions. No increase in aggression toward staff was found. On the contrary, seclusion and restrain rates dropped. | Moderate |
| Kidd et al (2015) | Canada | Experimental feasibility study | 5 patients with schizophrenia | Interior design | Patients' bedrooms | Installing digital picture frames in patients' rooms prompted patient-staff conversations, served as a positive distraction for patients and improved their physical environment. | Not rated |
| **MIXED-METHOD STUDIES** | | | | | | | |
| Boydell & Everett (1992) | Canada | Quasi-ethnographic | 14 long-term psychiatric patients | Architectural features | Community facility | The residential milieu (low-rise building, single units with separate space for collective activities) improved perceived relationships and personal growth of patients. No increase in patients' informal social networks occurred during one year post-move to supported housing. | 18/25 |
| Smith and Jones (2014) | UK | Observational | 7 male psychiatric inpatients, 10 staff | Ambient features | Sensory/comfort room | The sensory room (5 m x 2.5 m, light blue painted walls, laminate flooring, one window, bubble tube, light/image emitting projector, variety of cushions, stress relief toys and educational materials) provided a place of refuge as well as de-escalation, relaxation, socialization, and the ability to enjoy sensory activities, especially music. The majority of patients and staff believed the room evoked a sense of community and provided a space for socializing. In addition to experiencing better engagement with fellow patients, both groups believed the sensory room improved staff and patient communication and the overall experience in the unit. | 16/25 Moderate |
| **QUALITATIVE STUDIES** | | | | | | | |
| Anderson (1976) | USA | Post-occupancy evaluation | 8 hospital staff | Architectural features | Building location | Community location facilitated interaction between community groups and psychiatric patients. Open communal spaces coupled with the use of private rooms and living rooms improved staff-patients social interaction. | 12/25 |
| Olson (1993) | USA | Post-occupancy qualitative study | Residents with history of mental illness | Interior design | Community facility Communal areas | After the renovations to two hotels (small single occupancy rooms, plain, basic amenities, and little communal space), residents were positive about having their own personalised and homelike space. They criticised the units for being too small, without space to have visitors. The majority felt that several functionally distinct social spaces would improve their housing (e.g. small lounge for TV viewing, separate game and music room, an outdoor patio, small visiting areas, quiet areas to sit and read or have a small-room meeting). These communal areas should be well-furnished, colourful, with bookcases and living plants. | 12/25 |
| Parr (2000) | UK | Ethnographic study | 30 people with mental illness | Interior design | Community facility | The inner city, drop-in day centre was a large room bordered by an office and a kitchen hatch with a pool table positioned opposite to tables with four chairs. The use of this space allowed people who wanted to be alone to sit around the pool table and watch the pool without interacting with others and people who wanted social | 17/25 |

**Table 1** (Continued)

| Publication | Country | Type of study | Participants | Design intervention | Psychiatric facility | Outcome | Quality rating |
|---|---|---|---|---|---|---|---|
| | | | | | | interaction to gather around the tables with chairs. | |
| Curtis (2007) | UK | Post-occupancy evaluation | 7 inpatients, 13 staff | Architectural features | Building location Hospital Communal areas Bedrooms Smoking rooms | Patients and staff require both interactive and private spaces. Patients occasionally want to 'escape' from staff and identify smoking places and separate communal areas (e.g. female lounge) as ideal for that purpose. | 16/25 |
| Donald (2015) | Australia | Observational qualitative study | 20 psychiatric inpatients | Architectural features Interior design | Inpatient wards Outdoor space | Patients described the ward's built environment as 'confusing' (e.g. being between a hospital and a home without being either). Patients complained of boredom, unit's limited amenities and opportunities for community integration. The closure of the courtyard instigated patients' feelings of confinement and a natural vision for the ward. | 20/25 |
| Johansson (2007) | Sweden | Ethnographic study | 12 acute inpatients with affective and eating disorders, 25 staff | Architectural features | Inpatient ward Communal areas | The communal areas of the ward (e.g. combined dining and day room, patients' corridor, activity room and smoking room) were identified as the key social spaces containing a mix of encounters between people, in a continuum of professional care to private meetings and social events. | 16/25 |
| Shattell (2008) | USA | Observational qualitative study | 10 inpatients with mood, anxiety, or substance misuse, 9 female nurses. | Interior design | Nursing station | Nurses felt caged in by the plexiglass-enclosed nursing station and reported that the unit included 'too much nursing station space and not enough patient interaction space.' Participants received support mostly from members of their peer groups: patients supported patients and nurses supported nurses. | 18/25 |
| Skorpen (2008) | Norway | Ethnographical study | 16 psychiatric inpatients and 23 staff, 19th century asylum | Architectural features | Inpatient ward Smoking room | The design and architectural placement of the smoking room gave the patients privacy and a surveillance point to gain information about the ward's activities. Patients found that beneficial as the smoking room became a place for genuine peer support. Despite Spartan furnishing, the room carried an atmosphere that included laughter, seriousness and corrections with many unspoken rules. | 16/25 |
| Parrott (2010) | UK | Ethnographic | 7 female and 12 male forensic inpatients with severe mental illness | Interior design | Inpatient ward | The design of units was intended to embody an ethos of domesticity: short corridors, single bedrooms, open-plan sitting and dining room with wide-screen television, bowls of fruit and plants, and access to a garden from various spaces. The setting also featured architecture of security and surveillance (e.g. perimeter fencing, windows that could not be fully opened, panic alarms and double-locked entrance and exit doors).Patients aspired to retain a sense of the artificiality of their hospital stay, preferring to confine their notion of 'real' relationships to those that exist outside the institution. Potentially isolating activities (e.g. watching television and looking at photographs in their room) are helpful to counter feelings of loneliness and isolation. | 14/25 |
| Novotna (2011) | Canada | Pre-post occupancy | 72 substance misuse patients, 40 staff | Architectural features | Building location Communal areas | The move from two traditionally designed inpatient units to the new facility with low-rise buildings, homelike design, single en-suite bedrooms, shared kitchen and dining area, living and multipurpose rooms led to increased patients-staff communications; preferred boundaries for both staff and patients; and reduced stigma of mental illness by increasing positive interactions with family. | 18/25 |
| Wood et al (a) (2013) | UK | Pre-post relocation ethnographic study | 9 carers, staff (number not given). | Architectural features | Visiting rooms | The move from a nineteenth-century asylum with a recreation hall to a purpose-built new hospital with more 'quiet' rooms used for family visits had multiple outcomes on patient-visitor interactions. | 19/25 |

**Table 1** (Continued)

| Publication | Country | Type of study | Participants | Design intervention | Psychiatric facility | Outcome | Quality rating |
|---|---|---|---|---|---|---|---|
| | | | | | | Carers and family members spent time in both indoor and outdoor areas. Carers valued the recreational hall and a space which allows people to practise their religious belief, thus supporting connections with family and community members. | |
| Wood et al (b) (2013) | UK | Pre-post relocation | 114 patients, carers, staff | Architectural features | Smoking spaces | The new purpose-built hospital provided outdoor shelters for use by smokers. Since staff no longer needed to escort patients off the wards to smoke, this contributed to a more therapeutic landscape, facilitating a more relaxed regime that gave patients an enhanced sense of personal freedom. The shelters were deliberately small which was problematic for patients during rainy days. | 18/25 |
| Shattell (2015) | USA | Observational qualitative study | 13 acute inpatients, 16 staff members | Interior design | nursing station | Nurses had mixed feelings about the enclosure, reporting that it provided for confidentiality and a concentrated work space but also acknowledged the challenge of the barrier for communication with their patients. Patients unanimously preferred the nurses' station without the barrier, reporting increased feelings of freedom, safety, and connection with the nurses after its removal. | 18/25 |

### 3.2. Architectural typology and external image

Psychiatric facilities are built in a wide range of sizes and architectural typologies [27,28]. The purpose-built facilities are usually organized with the central section set aside primarily for offices and activity areas and the wings for patient rooms. Eight studies explored what happened when patients were relocated from nineteenth century or early twentieth century hospitals to new, smaller, homelike, purpose built facilities. Old facilities were described as overcrowded, institutional environments with multibed rooms, cramped communal areas and lack of private spaces. Six studies showed that new environments were beneficial for social interactions, and patients reported greater satisfaction with their environment and received care [4,20,21,29–31]. Two studies showed that relocation led to no difference in perceived social support (functional measure of social interaction) [32,33]. Shepherd and colleagues compared five long-stay inpatient facilities and 20 community facilities to find out that inpatient facilities were characterised with poorer physical environment and significantly less staff-patient interactions [34]. A new type of psychiatric care often requires new type of environment. For example, the Soteria project provided a small (10–12 patients), homelike, intensive, interpersonally focused therapeutic milieu where patients exhibited a large effect size benefit in domains of psychopathology, work, and social functioning [35].

Three studies addressed the role of corridors. Sommer and Gilliland [36] found that patients who were friendless tended to congregate in the corridors (56% compared to 31% in day room). Another study restructured an acute 30-bed ward by breaking up long corridors and as a result, social interaction increased, interactions moved from corridors to a visiting room and a cafeteria, and there was a marked increase of visitors [37]. Srivastava and Good [38] showed that the location of communal areas at the extreme ends of bedroom and service wings activated the connecting corridors.

### 3.3. Interior design interventions

Twenty-eight studies explored the role of interior design in changing social interactions. Interventions such as socio-petal furniture rearrangement (chairs arranged around tables) [39,40], installation of waist-high partitions to promote private conversations [37,38,41,42], new residential furnishings [43], introduction of plants [43], and availability of leisure-time resources (e.g. games, cards, books, magazines) [39,40,44,45] have been found to facilitate and increase social interactions. Two studies showed that interventions such as changes in furniture style, floor covering, and colour scheme, can improve staff members' and patients' satisfaction with new environments but have no effect on perceived social support [46] or social isolation [41].

### 3.4. Specific spaces within psychiatric facilities

#### 3.4.1. Communal areas – key social spaces

Eleven studies explored the design of communal areas within psychiatric facilities. Several studies have identified lounges, dining rooms, and lobby areas as key social spaces which serve as locations for meetings with family members, having casual interactions with peers and staff, and for participating in structured therapeutic activities [30,38,47–49]. Two studies showed that when patients are offered to use communal spaces, they usually take up this opportunity and social encounters tend to move from corridors and bedrooms into communal areas [37,50]. However due to redistribution of social activity, isolated and withdrawn behaviour can still appear in another place [49,51]. The provision of several functionally distinct social spaces can allow opportunities for activities which replicate family life and social activity in the community [30,32,52,53].

#### 3.4.2. Patients' bedrooms

Individual bedrooms can give patients freedom to withdraw when feeling unwell and to determine their own rhythm of activities [25]. Only one study focused specifically on the bedroom size and function. Ittelson and colleagues observed social behaviour of psychiatric patients in three large hospitals in the USA with varying bedroom sizes, and found that wards with single or double rooms had more social activity, while dormitory rooms had more isolated passive behaviour (e.g. lying on a bed) [51]. Patients tend to decorate and personalise their rooms and two studies identified patients' personal objects and photographs as

important mediators of sociability [54,55]. In a small pilot study, Kidd and colleagues installed digital picture frames in patients' rooms and this prompted patient-staff conversations, served as positive distraction for patients and improved patients' appraisal of physical environment [55].

### 3.4.3. Nursing stations

Nursing stations are focal points of staff-patients interactions, and these interactions tend to gradually decrease with a larger distance from nursing stations [38,56]. The impact of an open vs. closed nursing station was addressed in six publications. Shattell and colleagues reported that the nurses felt caged-in by the plexiglas-enclosed nursing station [6]. After the glass had been removed, there were no statistically significant differences in patient or staff perceptions of social involvement or social support [57]. A qualitative study of the same intervention showed that nurses had mixed feelings about the intervention. Patients unanimously preferred the nurses' station without the barrier, reporting increased feelings of freedom, safety, and connection with the nurses after its removal [6]. Two studies showed that the removal of the glass panel significantly increased staff-patient interactions [4,58]. Whitehead showed that open nursing stations motivated staff to interact with patients [37].

### 3.4.4. Smoking rooms

Three studies have indicated that the space in which patients smoke can serve as a platform for positive social interactions and resistance to institutional control [23,25,30]. Skorpen and colleagues reported that patients considered the smoking room as their own arena and a place for genuine peer support, mainly because staff was not able to observe all the interactions going on in the room [23]. Wood and colleagues explored the role of smoking areas in a newly built psychiatric hospital [59]. In the old hospital, there had been a gradual change from the days where everywhere was regarded as a smoking area to dedicated smoking rooms that over time were reduced to the size of telephone boxes in order to discourage patients from spending time there. The new hospital provided smoking shelters in the courtyards and since staff no longer needed to escort patients off the wards to smoke, this contributed to a more relaxed regime that gave patients an enhanced sense of personal freedom.

### 3.4.5. Outdoor spaces

Five studies explored the role of outdoor spaces and links between indoor and outdoor spaces. Srivastava and Lawrence showed that social groups on psychiatric wards commonly tended to form near windows which visually connected the ward with the outside world [38]. In a pre- and post-relocation study, Long and colleagues found that patients preferred wards with social areas with windows, visibility and better access to outdoor (trees and lawns) and with interior green space (courtyards with plants and water features), however, these features had no effect on perceived social support [33]. In another study, fresh air was mentioned to decrease the 'suffocating' feeling of the acute care environment [6]. Importantly, patients reported their frustration because although available, the courtyards were difficult to access and patients often felt trapped on wards [5]. Carers have also emphasised their preference for domestic gardens in psychiatric facilities which they could visit with their family members [30].

### 3.5. Ambient features

The role of ambient features has received significantly less attention compared to architectural and interior design interventions. Smith and Jones [60] explored patients and staff perspection of a sensory room at a psychiatric intensive care unit.

The room provided stimuli (e.g. lights, sounds, textures) and staff support for individual or group-based intervention to encourage patients to decrease stress, anger, and anxiety. The majority of patients and staff believed the room evoked a 'sense of community' and provided a space for socializing. In a pre-post renovation study, researchers found no significant effect of changes in lighting on social behaviour on wards [43].

### 3.6. The relationship between physical environment, positive and negative social interactions

Eleven studies explored the relationship between physical environment and negative social interactions within psychiatric facilities. A large study of 199 psychiatric wards in the Netherlands identified 14 design features with significant effect on the risk of being secluded during admission [61]. For example, the presence of an outdoor space, special safety measures, and patient over-crowding increased the risk of being secluded, while features such as more total private space per patient, a higher level of comfort and greater visibility on the ward decreased the risk of being secluded. The study controlled for length of stay, patient characteristics, general ward characteristics, and number of staff. The finding of an increase in risk of seclusion with the presence of an outdoor space or garden is not consistent with the literature. The authors suggested that this finding may have been biased because their data was limited to two items:the presence of an outdoor space (yes/no) and the height of the fences. Other relevant information such as the quality or attractiveness of the outdoor space or garden and whether or not patients actually had (free and/ or unsupervised) access to the outdoor space, was not documented [61]. Seven studies showed that renovation [41,57,62] or relocation of patients to a new, purpose build facility [63–66] was associated with reduction in violent incidents, seclusion or restraint. Southard and colleagues showed that the removal of the glass from the nursing station did not lead to increase in aggression toward staff, on the contrary, seclusion and restrain rates dropped [57]. Several studies showed that interventions such as enlargement of the physical space [67–69] or rearrangement of ward furniture [40] were not associated with significant decline in incidents. In one of these studies the new unit was substantially larger, but operated with the same number of staff which may have prevented better use of the new space [67,68].

### 3.7. Robustness of synthesis

The overall strength of evidence was moderate. The mean RATS score for the 22 qualitative studies was 15.1 (range 12–19), including 15 high quality studies (RATS ≥ 15) and 7 moderate quality studies (RATS = 12–14). The Effective Public Health Practice Project (EPHPP) ratings for 27 quantitative studies indicated they were of moderate quality. One study was not rated because of insufficient information on methodology within this paper [55]. One study included both qualitative and quantitative components [60]; both were rated as moderate quality. In two areas the quality of studies was problematic. Only ten of the included studies considered researcher bias influencing results. Secondly, 16 studies reported information on ethical issues or ethics approval. Studies published in 1970s and 1980s largely did not report this information. All papers were rated by two reviewers (NJ and JC) who achieved acceptable concordance (93%).

## 4. Discussion

The review identified several design features that—based on the existing evidence—may be regarded as fostering social interactions in psychiatric facilities. The main ones include community

location; newly designed or renovated, small (up to 20 beds), homelike facilities with a wide range of communal areas; single/double bedrooms; open nursing stations; right balance between private and shared spaces; and specific design interventions such as arranging furniture in small, flexible groupings (see Table 2). The level of evidence linking these design features to the level of social interaction among the users of psychiatric facilities is low to moderate which is often in line with research in other medical fields [9]. However, the exception is the finding that levels of social interaction increase when introducing a range of communal spaces with comfortable, movable furniture arranged in small, flexible groupings. This evidence is notably strong because it stems from well-designed, randomised-controlled trials conducted in the 1970s [39,70,71]. In the following decades studies in this field were mainly observational with/without controls and no random-ised-controlled trial had been conducted to explore the links between design solutions and social interaction (see Table 1).

Several findings from this review warrant further discussion. For example, we found that building psychiatric facilities within local communities rather than in isolated locations might improve patient interaction with others. However, it is important to emphasise that this alone is not enough to help patients to increase the size of their social networks or renew family relationships, which suggests the need for a new way of conceiving psychiatric environments. Design needs to engage people, creating opportunities for more interaction between community members and patients in or close to psychiatric facilities [5,20,26]. Similarly, homelike environments might be beneficial for social interactions between staff, patients and carers because they allow oppor-tunities for the replication of family and community activities. One of the important themes identified in this review was the balance between private and shared spaces. In order to engage in positive interactions both staff and patients need to have their own space to retreat when feeling overwhelmed [4,6,51,72]. The design of these spaces can include 'territorial' demarcations that separate 'interaction' from 'private' spaces, thus helping patients and staff

to exercise choice over how and when they use the space [73]. Patients' private spaces are their bedrooms, and our findings indicate that single and double bedrooms are more beneficial for social interactions than multi-bed dormitories. Studies from other medical disciplines show that single rooms are better for patient-family interactions (by providing more space and furniture than double rooms) [74,67], while double bedrooms may have benefits for patient-patient interactions [75,68]. A systemic approach to social interaction in psychiatric facilities would treat violent incidents as types of interactions [69]. The question is whether a reduction in violent incidents would increase chances for positive interactions. This remains unclear and we were not able to identify studies exploring that question. Several studies showed that renovation or relocation of patients to a new facility was associated with reduction in violent incidents, seclusion or restraint. As explained by Borckardt and colleagues, the physical changes to the environment served as constant reminders to staff of the commitment to behavioural change such as eliminating use of seclusion and restraint [62]. Perhaps, the balance between private and shared spaces may be the key in understanding this relationship because violent incidents are more likely to occur on crowded wards with higher average noise level, more patient-patient interactions, and less opportunities for patients to find rest or privacy [67,76]. There are two types of spaces that have specific connotations in psychiatric facilities: corridors and smoking rooms. While studies from other medical disciplines have identified long corridors as inefficient for staff [11], in psychiatric hospitals, this feature can also be detrimental for patients by fostering social isolation [36,37]. Psychiatric patients have identi-fied smoking rooms as important spaces that can offer 'escape' from observation and institutional control. With the smoking ban in place in psychiatric facilities in many countries, the question is which places will provide the same function for patients. The answer may not lie in the design of hospital environments, but rather in the type of provided care and risk management. The introduction of a comprehensive smoke-free policy seems not only

**Table 2**
Key design interventions that can facilitate positive interactions among users of mental healthcare facilities.

| | | Design interventions |
|---|---|---|
| **Location/Site** | | Building mental health facilities within local communities vs in isolated locations can have several advantages: to encourage patients to spend more time in the community and use local resources [20–22], to enable families to regularly visit patients [25,47], and to reduce stigma of mental illness and mentally ill patients [47]. |
| **Building/architectural features** | | Architectural typology that resembles hotel/hostel/bungalow-type with external image blended with the neighbourhood scale and building forms is preferred by patients, staff, and carers. Six studies showed that relocating patients from asylums to new, smaller, homelike, purpose-built facilities was beneficial for social interaction [4,20,21,29–31]· Seven studies showed that renovation [41,57,62] or relocation of patients to a new, purpose build facility [63–66] was associated with reduction in violent incidents, seclusion or restraint. |
| **Interior design** | | Arranging furniture in flexible groupings (even short-term) [39,40], new residential furnishings [43], introduction of plants [43], and installing waist-high partitions to promote private conversations [38,41,42] have been found to increase social interactions. Chairs should not be arranged shoulder to shoulder along the walls of the room. Games, cards, books, magazines placed on tables can facilitate social interaction [39,40,44]. Patients' photographs, cards and gifts from family or friends can be considered as important mediators of sociability [54]. |
| **Ambient features** | | Sensory (comfort) room is a place where stimuli such as lights, sounds, textures, and staff support can be used with patients during de-escalation, self-regulation, and calming. Patients consider this room to provide sense of community and a space for socializing [60]. Overall little research was available. |
| **SPECIFIC SPACESS** | **Corridors** | Long corridors should be avoided; socially isolated patients tend to congregate in the corridors [36]. Interventions to break up long corridors were found to be beneficial for social interaction [37]. |
| | **Communal areas** | The provision of a wide range of social spaces (e.g. smaller and bigger lounges, visiting areas) and good balance between private and shared spaces is beneficial for social interaction. Both staff and patients need private spaces to retreat from intensive interactions. |
| | **Patient bedrooms** | The provision of single or double bedrooms vs large dormitories can increase social activity [51]. |
| | **Nursing station** | Opened nursing stations are preferred by patients and staff and tend to increase staff-patient interactions [4,37,58]. |
| | **Smoking rooms** | Despite small size and poor furnishing, patients valued these places as their arena and place for genuine peer support [23,25,59]. The introduction of a comprehensive smoke-free policy seems to be beneficial for patients' health but also appears to reduce the incidence of physical assaults [77]. |
| | **Outdoor areas** | The provision of courtyards and gardens was valued by patients and visitors [5,6,30], but access is often problematic. Overall little research evidence was available. |

be beneficial for patients' health but also appears to reduce the incidence of physical assaults [77]. Despite anecdotal evidence that rooms for group psychotherapy, occupational therapy and arts therapies can facilitate social interaction, we were unable to identify studies exploring this topic.

The review has both strengths and limitations. This is the first systematic review of architectural typologies and design solutions that can potentially foster positive social interactions in psychiatric facilities and, thus, may help patients in re-establishing their social roles in the community. Using social interactions as an outcome, we focused our aim on a more robust, behavioural criterion which was helpful in clearly defining the evidence. Our synthesis was moderately robust and was limited by the fact that several studies used small convenience samples or pre- and post- assessments with no control group. The studies included both direct and indirect measurements of social interaction. The interpretation of indirect measures such as perceived social support may be problematic because the interaction between physical and social environment appears to be actively filtered by the individual's perception and possibly mental health problems [78]. Although the review focused on adult settings (age 18–65), one study included a proportion of old age patients [43] and one study included a proportion of old age and adolescent patients [62]. The review focused on built environment aspects of the patient experience of a psychiatric facility and while maintaining this focus was needed to address our research question, we are aware that the overall patient experience may be influenced by a number of social and cultural influences. Studies included in this review were conducted in developed, Western healthcare systems and translating the findings into other countries and healthcare systems needs to take into consideration the role of relevant cultural and social factors. Despite these limitations, the study adds to the literature on hospital built environment by identifying several candidate interventions that could be considered when planning psychiatric facilities.

The main implication for practice is that there is considerable evidence that should be taken into account when planning or renovating psychiatric facilities. The review attempted to identify architectural typologies and design solutions which could foster helpful social interactions between users of psychiatric facilities. We hope that this will contribute to further understanding of the milieu of psychiatric facilities. Our findings can guide future design interventions, but it is important to emphasise that design or retrofitting of a psychiatric facility is a complex process. How design solutions identified in this review could potentially fit together can depend on a number of factors. For example, the environmental interventions in psychiatric facilities always need to consider safety of patients, staff, and visitors, which can be seen as both challenge and opportunity for designers and mental health professionals to come up with innovative solutions. Next, the process of design and renovation need to include patients, staff, and families to ensure that their values, beliefs and cultural backgrounds are incorporated into the planning and delivery of care. Lastly, a proactive plan can anticipate budget restrictions which may involve trade-offs or building in phases.

## 5. Conclusion

The design of psychiatric facilities, from needs assessments and program planning to the creation of new spaces should be guided by research evidence. This study has identified a set of interventions that should be considered in the design of psychiatric buildings to the same extent as other factors such as cost, maintenance, and harmony. Some of the identified design interventions are easy and non-costly to implement in existing hospitals (e.g. socio-petal furniture arrangement, residential-like furniture), whilst others require major investment and can be established only in new buildings (e.g. range of social spaces, good balance between social and private spaces). The findings might be particularly helpful to colleagues in countries that are moving from asylum-based to community-based services. Research in this field has been largely focused on inpatient settings. Future research should pursue well-designed studies on outpatient settings and supported housing as well as on the role of outdoor spaces.

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