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Design features that reduce the use of seclusion and restraint in mental health facilities: a rapid systematic review

Sanne Oostermeijer ,[1] Catherine Brasier,[2] Carol Harvey,[3] Bridget Hamilton,[4] Cath Roper,[4] Andrew Martel,[5] Justine Fletcher,[1] Lisa Brophy[2]

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[1]Melbourne School of Population and Global Health, The University of Melbourne, Melbourne, Victoria, Australia
[2]Social Work and Social Policy, La Trobe University, Melbourne, Victoria, Australia
[3]Psychiatry, The University of Melbourne, Melbourne, Victoria, Australia
[4]Centre for Psychiatric Nursing, The University of Melbourne, Melbourne, Victoria, Australia
[5]Melbourne School of Design, The University of Melbourne, Melbourne, Victoria, Australia

Correspondence to
Dr Sanne Oostermeijer; sanne.oostermeijer@unimelb.edu.au

ABSTRACT

Increasing efforts are being made to prevent and/or eliminate the use of seclusion and restraint in mental health facilities. Recent literature recognises the importance of the physical environment in supporting better outcomes in mental health services. This rapid review scoped the existing literature studying what physical design features of mental health facilities can reduce the use of seclusion and physical restraint.

Design A rapid review of peer-reviewed literature.

Methods Peer-reviewed literature was searched for studies on architectural design and the use of restraint and seclusion in mental health facilities. The following academic databases were searched: Cochrane Library, Medline, PsycINFO, Scopus and Avery for English language literature published between January 2010 and August 2019. The Joanna Briggs Institute's critical appraisal tool was used to assess the quality of included studies.

Results We identified 35 peer-reviewed studies. The findings revealed several overarching themes in design efforts to reduce the use of seclusion and restraint: a beneficial physical environment (eg, access to gardens or recreational facilities); sensory or comfort rooms; and private, uncrowded and calm spaces. The critical appraisal indicated that the overall quality of studies was low, as such the findings should be interpreted with caution.

Conclusion This study found preliminary evidence that the physical environment has a role in supporting the reduction in the use of seclusion and restraint. This is likely to be achieved through a multilayered approach, founded on good design features and building towards specific design features which may reduce occurrences of seclusion and restraint. Future designs should include consumers in a codesign process to maximise the potential for change and innovation that is genuinely guided by the insights of lived experience expertise.

Strengths and limitations of this study

- A rapid review including 35 studies with use of a recognised critical appraisal tool to assess the quality of included studies.
- The authors brought diverse experiences, roles and disciplinary backgrounds to the review and included consumer commentary to provide a lived experience perspective.
- Studies published in languages other than English were omitted.
- While evidence concerning architectural design features is more typically found in grey literature, such literature was not included.

INTRODUCTION

Recent literature affirms the importance of the physical environment in supporting better outcomes in mental health services generally.[1–4] Several key design features for mental health facilities have been identified that may impact on broader mental health outcomes and consumer experiences,[5] including evidence on aggression, environmental stressors (eg, noise) and stress-reducing elements (eg, nature).[6] These key design features are summed up in table 1. However, it has been noted that there is a lack of rigorous evaluations in health architecture generally and mental health architecture particularly.[5]

Arguably, the design of psychiatric facilities generally has not provided sufficiently welcoming environments due to a focus on security features, and being reliant on traditional architectural approaches.[6] Emphasising personal recovery has been an important influence on mental health policy and practice.[7–9] Various challenges exist in taking a recovery-oriented approach in inpatient units, especially when people have been admitted involuntarily. Enabling choice, including choice of treatment, safety, connection with others and upholding human rights are important to ensuring that an admission remains recovery oriented.[10] Further, it is often overlooked how the physical environment could contribute to trauma-informed practice.[11]

The physical design of inpatient mental health facilities should use good basic design. This refers to design principles which influence everyday well-being and mental health, such as access to daylight, noise reduction and

Table 1 Identified design features impacting on broader mental health outcomes and consumer experiences

Design features	Description
Security and privacy	The need for considerations of security, violence, privacy and overcrowding.[5] A need for single patient rooms with private bathrooms to reduce crowding stress.[6]
Natural (day) and artificial lighting	The importance of light for controlling/influencing the circadian system, eating and sleeping patterns, depression, agitation and stress.[5 6]
Therapeutic milieu	Includes therapeutic design and environments, patient-centred design and healing environments.[5]
Green spaces, gardens	The need for accessible gardens.[5 6]
An enriched environment	The need to balance complexity, order and aesthetic considerations which impacts on health outcomes and assists in avoiding confusion.[5]
Interior or home-like design (eg, furnishings, colour, wayfinding)	The need for clear visual communication balanced with a home-like environment.[5 6]
Nursing/staff stations	Nurse-only and consumer-only spaces were found to be beneficial. However, closed nursing stations often convey an image of staff inaccessibility.[5] Staff stations close to activity areas.[6]
(Nature) art	The impact of art on consumer well-being.[5 6]
Ward layout for smaller consumer groups	Design to lower crowding and social density.[6]
Movable seating in spacious rooms	Communal areas with movable seating and ample space to regulate relationships in order to reduce crowding stress.[6]
Low noise/good acoustics	Noise-reducing design in order to reduce environmental stress.[6]
Nature window views	Design as part of stress-reducing positive distractions.[6]
Model of care considerations	The need for a balance between drug therapy, environmental context and psychological and social therapy and interactions.[5]
Designing for subgroups, such as adolescents and those with dementia	The need for specific considerations when designing for subgroups.[5]

air ventilation. These principles were codified in the 19th century in response to concerns about the health impacts of the built environment on people and form the basis of current building regulations.[12] A large architectural firm, Hassell Studio,[13] released principles of design for a successful mental health facility, based on their project experience and research into 'evidence-based design' (EBD). They noted that the Center for Health Design in the USA has collated more than 2000 papers on EBD but point out that very few specifically address mental health. Hassell Studio has described the critical attributes of a successful mental health building as including: light, elimination of environmental stressors, safety, observation, avoidance of visual disturbance, colour, group interaction and access to nature. These elements are in line with the key design features identified to impact on mental health outcomes and consumer experiences.[5 6]

Increasing efforts are being made to prevent and/or eliminate the use of restraint and seclusion, acknowledging that its use is traumatic, risk focused and often unhelpful.[14–18] In exploring ways to reduce seclusion and restraint, the association between the physical characteristics of the environment and a reduction in the use of seclusion and restraint has been highlighted.[14] The key design features previously identified (see table 1) offer foundation for good design of inpatient mental health facilities and potentially contribute towards the reduction or elimination of the use of restraint and seclusion. The considerations discussed above can be conceptualised as a layered response to the reduction and/or minimisation of harm to consumers in mental health facilities. Each of these concepts is interlinked, representing a continuum of less (distal) to more direct (proximal) approaches to the reduction of restraint and seclusion.

The importance of the physical environment in reducing the use of seclusion and restraint is an emerging health issue with relevance for future evidence-based policymaking and practice. A rapid review was conducted to summarise current evidence on this topic in a timely manner to inform future codesign, facility and infrastructure planning processes.[19] This rapid review aimed to provide an overview of the current research literature of architectural design features of mental health facilities that can help reduce the use of seclusion and restraint. It was part of an Evidence Check rapid review brokered by the Sax Institute for the NSW Ministry of Health.[20] This was performed by an interdisciplinary team, including two consumer researchers who provided consumer commentary throughout the paper at critical points (included as italic text).

METHODS

Search strategy

This rapid review was brokered by the Sax Institute for the NSW Ministry of Health, as such the research team received the specific research topic and aim based on the needs of the NSW Ministry of Health.[20] A comprehensive search strategy for academic literature a priori was developed by two researchers (SO, CM), a research librarian (EL) and with advice from a senior researcher (LB), as well as input from the commissioning agency. A full list of search terms and limiters used is included in online supplemental appendix 1. This included studies that directly reported the impacts of physical design features of mental health facilities on the use of seclusion and physical restraint. Initial search terms were identified from these relevant publications and from the Evidence Check brief received from the commissioning organisation. Additional input was obtained from research team members with lived experience and clinical, architectural and academic expertise. A broad definition of 'design' and 'design features' was used to include any relevant material, such as chairs, heavy and fixed or light and movable, or doors, locked or unlocked—as well as more traditional design features of room layouts and sightlines from nursing stations. Studies on sensory modulation and other interventional approaches or programmes to improve care or outcomes were only included if they specifically mentioned a physical feature, for example, the introduction of a sensory or comfort room.

The following academic databases were searched: Cochrane Library, Medline, PsycINFO, Scopus and Avery. Additional literature was identified from the expert knowledge of academics on the research team. Inclusion criteria were as follows: studies that directly reported the impacts of physical design features of mental health inpatient facilities on the use of seclusion and physical restraint; mental health inpatient settings including adult and child and adolescent services, psychiatric intensive care units (PICUs) and forensic mental health inpatient units; studies published between January 2010 and 28 August 2019; English language only. Non-peer-reviewed studies and literature reviews were excluded, but their references were used to identify additional literature.

Patient and public involvement

This research included consumer researchers throughout its design, conduct and writing. One consumer academic conducted the critical assessment of the included publications and a consumer commentary has been included throughout the manuscript.

Study selection

Results from the literature search were uploaded and screened for duplication. One reviewer performed an initial screening of studies via titles (SO), with a second reviewer performing a more comprehensive screening of titles to further reduce the literature for abstract and full-text screening (CM). Two reviewers screened studies via abstract and subsequently via full text (SO, CM). They assessed for inclusion independently at both stages. Disagreements were resolved through consultation with a third reviewer (LB).

Critical appraisal

The quality of the included publications was assessed using Joanna Briggs Institute's (JBI) critical appraisal tools[21] to assess the risk of bias across studies, such as selective reporting. Reduction in seclusion and/or restraint was considered the primary reporting outcome. The JBI's critical appraisal tools address a wide range of study types (eg, qualitative, case–control, expert opinion) and provide a robust assessment of trustworthiness. Each item of the assessment was assessed as 'yes', 'no', 'unclear' or 'not applicable'. In this assessment, studies that used a non-randomised design were assessed using the 'quasi-experimental checklist'. Each publication is reported separately and should be considered on its merits.

Data extraction and synthesis

Data of academic literature were extracted by one reviewer (SO) and checked for accuracy and completeness by a second reviewer (CM). Extracted data included: source (authors, year), country, study design, population or setting, number of studies/participants, intervention or comparator, measures, physical design feature, impact on restraint and seclusion, outcomes and magnitude of effect. After data from the included studies were extracted, categorised and collated, we synthesised the results and identified overarching themes across studies.[22]

RESULTS

Included studies

In total, 35 publications were included in this review[4 6 23–55] which reported on seclusion,[23 29 41 42 44 47 51 54] restraint[4 6 24 30 55] or both seclusion and restraint[25–28 31–36 39 43 45 46 48–50 52 53] within mental health inpatient units. Preferred Reporting Items for Systematic Reviews and Meta-Analyses chart[56] is reported in figure 1.

Table 2 presents an overview of the included studies. Sixteen studies involved a pre/poststudy, seven studies were qualitative studies and three studies used a mixed methods approach, four were retrospective cohort studies and one study was a prospective cohort study, three studies were case–control studies and one study used a Delphi method. The studies were performed in a variety of settings including 12 inpatient psychiatric facilities, 1 university clinic, 8 acute inpatient settings, 6 PICUs, 3 child and/or adolescent inpatient settings, 3 forensic inpatient settings and 1 inpatient setting for older people. Additionally, two studies included consumers with lived experience of restraint and/or seclusion and their supporters (see table 2).

Most studies involved minor to more substantial changes to the physical environment, such as repainting

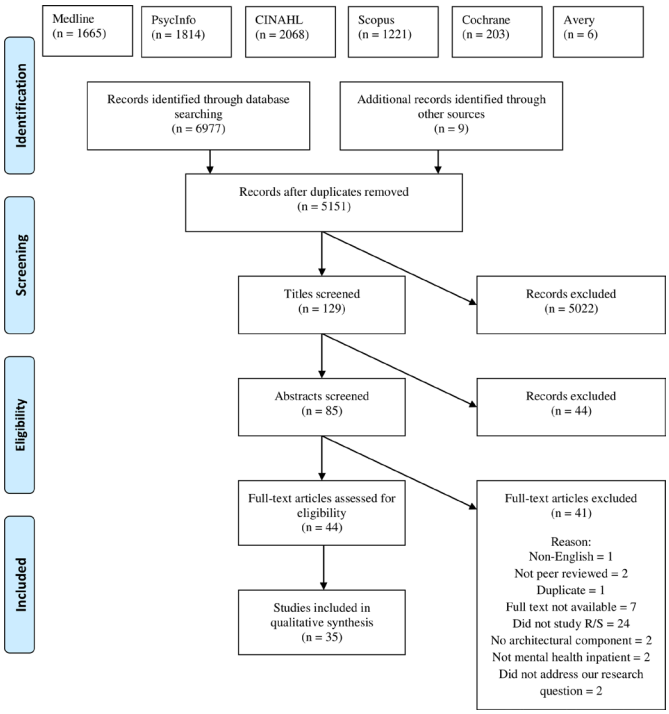

Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) chart. The flow diagram shows the different phases of the rapid systematic review, as it maps out the number of records identified, included and excluded, and the reasons for exclusions. R/S, restraint/seclusion. (Reproduced from Brophy et al)[20]

the walls or moving to a new purpose-built unit, either as part of a broader intervention to improve the quality of care or due to planned renovations. A total of nine publications reported significant reductions in the use of seclusion[23 26 28 41] or restraint.[4 24 28 34 55] Additionally, one study reported a statistically significant reduction in 'full restraint' but a statistically significant increase in 'partial restraint'; however, these terms were not defined.[27]

Critical appraisal

Findings from the JBI's critical appraisal tool are presented in (online supplemental tables 1–4). One publication was assessed using the JBI's critical assessment tool for case–control studies and scored unclear for all 10 items[4] (online supplemental table 1). Among 26 quasi/non-randomised trials, 21 were assessed as unclear or included 'no' for two or more items[6 23 24 26–30 33 35–37 39 41–45 47 49–55] (online supplemental table 2). Of the 10 (partly) qualitative studies, seven were assessed as unclear or included 'no' for two or more items[25 31 32 37 38 40 46 48 51 53] (online supplemental table 3). One expert opinion publication was assessed as unclear or no for two or more items[34] (online supplemental table 4).

Design themes

We identified several overarching themes in design efforts to reduce the use of seclusion and restraint: a beneficial physical environment; sensory and/or comfort rooms; and private and uncrowded/calm spaces. These elements are reported below. We include a consumer perspective statement to introduce each theme, underscoring the experience of each reported element of service design.

A beneficial physical environment

If consumers receive messages (intentional or not) that they are not worthy of care, quality and freedoms (and are instead seen as risky or incompetent), these can follow an individual after discharge, making 'spirit breaking'[57] experiences more likely.

There is a tangible legacy between aspects of the design of the asylums and many of the subsequent inpatient units. We often call nurses' stations the 'fishbowl' or 'shark tanks'. This speaks to our experiences of being surveilled—sightlines to the nurses' station; use of cameras, which can be experienced as intrusions into privacy. We are known to joke: 'you're not paranoid, they really are watching you'. Colocated units (mainstreaming) can feel much more like hospitals than 'homelike environments'.

Several studies involved beneficial changes to the physical environment that reduced the use of restraint and seclusion, ranging from more simple aesthetic enhancements to full relocation (see table 2). Two studies suggested that simple aesthetic improvements to the physical environment may reduce the use of restraint and seclusion, including the introduction of warm colours, rugs, plants and new furniture.[28 43] Another study reported a reduction in restraint after a more substantial renovation, which included increased ward space, changed room settings with more privacy, more natural lighting and modern home electronics and large balconies.[34] Two studies reported reductions in seclusion after a full relocation.[39 41] One reported a reduction in seclusion, seclusion duration and aggressive incidents after full relocation, with the new ward being rated by consumers as having increased privacy, greater access to therapeutic activity space and increased visibility.[41] The other study reported the use of seclusion being almost eliminated after relocation to a new ward, which included a focus on non-coercive management, involving improvements of single rooms, free access to an enclosed garden, recreational and simple sport facilities.[39] One study did not find any effect on seclusion or restraint after moving to a new facility, even with improved design features such as improved aesthetics and layout.[35]

For young consumers (aged 5–18 years), one study noted that artwork and colours had a positive impact on supporting young people to feel calm.[53] Specifically, in relation to reduced use of restraint and seclusion, staff noted the benefits of having an indoor pool. They also reported that the most commonly selected design elements experienced as calming and healing were those with characteristics of choice and control over an attribute, such as light dimmers and music panels.

One study reported 'the overwhelming perception of consumers was that the ward was untherapeutic'.[48] Consumers observed a major feature which led to instances of restraint or forced medication was that they were cooped up in the ward and not allowed to go outside and get fresh air. Some consumers likened the

Table 2 Summary information of included studies

Study (author, year)	Country	Study design	Population/setting	Sample size	Physical design feature	Measures	Reported effects on seclusion and/or restraint
Andersen *et al*, 2017[4]	Denmark	Case–control study	Inpatient psychiatric facility	2 inpatient units (1 control unit)	Sensory room	The number of belt restraints and forced medication	↓ R *Only significant in combination with chemical restraint*
Ash *et al*, 2015[23]	Australia	Prospective cohort study	Psychiatric intensive care unit (PICU)	1 inpatient unit (10 beds) 63 consumers	Comfort room	Number of consumers secluded and total number of seclusions, 1 and 2 years after introduction of the recovery-based practices. Exit interviews with consumers.	↓ S
Bak *et al*, 2014[24]	Denmark	Retrospective cohort study	Inpatient psychiatric facility	90 consumers from various inpatient units	No crowding	A questionnaire covering several preventive factors that might decrease the use of restraint, which included no crowding. The number of (mechanical) restraint episodes per unit over 1 year.	↓ R
Björkdahl *et al*, 2016[25]	Sweden	Qualitative study	Inpatient psychiatric facility	126 staff members	Sensory room	Self-reported 12-item questionnaire with both open-ended and closed-ended questions	↓ R/S (q)
Blair *et al*, 2017[26]	USA	Pre/post study	Inpatient psychiatric facility	8029 admissions postintervention 3884 admissions preintervention	Comfort room	Seclusion and restraint incidences and duration	↓ S ↑ R/S duration
Bobier *et al*, 2015[27]	New Zealand	Pre/post study	Child and adolescent inpatient psychiatric unit	1 inpatient unit (16 beds) 108 consumers with 145 admissions	Sensory room	Arousal measures before and after room use, incidents of seclusion and full and partial restraint	↓ S ↑ R (partial only)

Continued

Table 2 Continued

Study (author, year)	Country	Study design	Population/setting	Sample size	Physical design feature	Measures	Reported effects on seclusion and/or restraint
Borckardt *et al*, 2011[28]	USA	Pre/post study	Inpatient psychiatric facility	5 inpatient units 1 hospital	Changes to the physical characteristics of the therapeutic environment	Rate of seclusion and restraint (number of incidents per patient per day for each unit and each period). Measure of the quality of care, including the perceptions of the physical environment.	↓ R/S *Changes to physical environment the only intervention associated with reduction*
Bowers *et al*, 2010[29]	UK	Retrospective cohort study	Acute inpatient setting	67 hospitals 136 wards	Seclusion room available Access to PICU Main door locked Quality/complexity ratings of physical environment	The frequency of conflict and containment events (including seclusion and time out), information on the physical environment (quality and complexity ratings) and policies, and availability of a seclusion room and/or a PICU. Other measures also included consumer and staff variables.	↑ S × seclusion room ↑ S × access to PICU ↑ S × main door locked NS for quality/complexity ratings
Bowers *et al*, 2012[30]	UK	Retrospective cohort study	Acute inpatient setting	67 hospitals 136 wards	Seclusion room Main door locked Quality/complexity ratings of physical environment	The frequency of conflict and containment events (restraint and use of force), information on the physical environment (quality and complexity ratings) and policies, and availability of a seclusion room and/or a PICU. Other measures also included consumer and staff variables.	↑ R × seclusion room ↑ R × main door locked NS for quality/complexity ratings
Brophy *et al*, 2016[31]	Australia	Qualitative study	Lived experience consumers/supporters	30 consumers 36 supporters	Several design features	Ten focus groups in four Australian state capitals and a rural location	N/A
Brophy *et al*, 2016[32]	Australia	Qualitative study	Lived experience consumers/supporters	30 consumers 36 supporters	Ward design, private space	Ten focus groups in four Australian state capitals and a rural location	N/A

Continued

Table 2 Continued

Study (author, year)	Country	Study design	Population/setting	Sample size	Physical design feature	Measures	Reported effects on seclusion and/or restraint
Cummings *et al*, 2010[33]	USA	Pre/post study	Acute inpatient setting	105 consumers	Comfort room	Quantitative survey before and after using the comfort room, as well as frequency and duration of seclusion and restraint before and after the addition of the comfort room	NS
Dresler *et al*, 2015[34]	Germany	Pre/post study	University psychiatric facility	97–175 beds	Increased ward space (from about 200 m^2 for 16–18 consumers to 400 m^2 for 17 consumers). Changed room settings (from mainly 2–4 beds per room to only 1–2 beds per room). Improved sanitary arrangements (from 2 toilets/showers per ward to 1 for each room). More natural lighting (from small windows to almost picture windows). Modern home electronics and large balconies.	Number and duration of mechanical restraints and coercive medication	↓ R (all measures)

Continued

Table 2 Continued

Study (author, year)	Country	Study design	Population/setting	Sample size	Physical design feature	Measures	Reported effects on seclusion and/or restraint
Eggert *et al*, 2014[35]	USA	Pre/post study	Forensic psychiatric setting	353 staff members 526 consumers	Moving to a new High Security Forensic Institute (HSFI) constructed according to the design proposed by Dvoskin *et al* (2002).[66] This included improved facilities such as more space and different unit layout, proximity to ancillary facilities and improved aesthetics, such as natural light and efforts to normalise the environment.	Participants were interviewed 6 months prior to moving to the new HSFI as well as 6 and 12 months after moving. Involved a control group that did not move buildings. Used EssenCES to evaluate ward environments and Copenhagen Burnout Inventory (CBI). Also observed consumer-to-consumer assaults, consumer-to-staff assaults, seclusion and restraint episodes, consumer grievances, and unscheduled staff absences, consumer progressions and consumer discharges.	NS
Espinosa *et al*, 2015[36]	USA	Pre/post study	PICU	15 units Almost 350 mental health consumers	Comfort room	Satisfaction scores, episodes of violence, rates of seclusion and restraint (number and total time), length of stay, number of admissions and discharges, number of psychiatric emergencies, percentage of staff up-to-date in training	↓ R/S (all measures)
Fletcher *et al*, 2019[37]	Australia	Mixed methods study	Psychiatric inpatient facility	14 wards 103 staff	One of 6 domains of the Safewards model is the physical environment.	The purpose-designed survey included demographic characteristics and both quantitative and qualitative questions regarding the acceptability, applicability and impact of the Safewards model and 10 interventions.	↓ R/S (q) *Not linked to physical environment*

Continued

Table 2 Continued

Study (author, year)	Country	Study design	Population/setting	Sample size	Physical design feature	Measures	Reported effects on seclusion and/or restraint
Forsyth and Trevarrow, 2018[38]	UK	Qualitative study	Acute inpatient setting (male)	6 staff members (1 ward)	Sensory room	Thematic analysis was used on semistructured staff interviews.	N/A
Georgieva *et al*, 2010[39]	The Netherlands	Pre/post study	PICU	1 inpatient unit (4-bed) 8 consumers	Transfer to a newly developed unit focused on non-coercive management. The new ward was small (4-bed) and included single rooms, free access to an enclosed garden, recreational and simple sport facilities.	Number of days in seclusion before and after transfer for a period of 28 months	↓ S *Use of seclusion almost eliminated*
Hedlund Lindberg *et al*, 2019[40]	Sweden	Qualitative study	Psychiatric inpatient facility	28 consumers	Sensory room	After use of sensory room: short questionnaire of items use and free text on experience. One month after discharge: an individual interview (20–70 min).	N/A
Jenkins *et al*, 2015[41]	UK	Pre/poststudy	PICU	18 consumers	Transfer to a new purpose-built ward as recommended by the Psychiatric Intensive Care Advisory Service	Episodes of seclusion, duration of seclusion, aggressive incidents and the Environment Assessment Inventory (EAI)	↓ S incidents ↓ S duration
Lloyd *et al*, 2014[42]	Australia	Case–control study	Acute inpatient setting	2 acute inpatient units (1 control unit)	Sensory room	Seclusion rates	↓S

Continued

Table 2 Continued

Study (author, year)	Country	Study design	Population/setting	Sample size	Physical design feature	Measures	Reported effects on seclusion and/or restraint
Madan *et al*, 2014[43]	USA	Pre/poststudy (total of 10 years)	Inpatient psychiatric facility	1 mental health facility 5 units (95 beds)	Changes to the therapeutic environment, such as repainting to warm colours, decorative plants and rugs, replacing/restructuring furniture	The number of seclusion or restraint incidents per 1000 patient-days across all inpatient units	↓ R/S
Maguire *et al*, 2012[44]	Australia	Pre/post study	Forensic psychiatric setting	116 beds	Sensory room and reduction of seclusion rooms	Monthly seclusion events, number of consumers secluded and total hours of seclusion	↓ S (all measures) *Not statistically tested*
Mann-Poll *et al*, 2011[45]	The Netherlands	Delphi study	Inpatient psychiatric facility	4 institutions 17 wards 82 mental health professionals (66% worked on a closed ward)	Private space	Ratings of the vignettes on a 9-point Likert scale anchored at the extremes, ranging from 1 (seclusion is absolutely not necessary) to 9 (seclusion is absolutely necessary)	↓ S
Muir-Cochrane *et al*, 2015[46]	Australia	Qualitative study	Acute inpatient setting (short stay, old age)	3 units (20, 19 and 15-bed) 39 nurses	No crowding Quiet spaces	Interviews	↓ R/S (q)
Novak *et al*, 2012[47]	Australia	Pre/post study	Acute inpatient setting	75 occasions of sensory room use (1 unit)	Sensory room	Consumer distress, episodes of seclusion and aggression incidents	NS
Rose *et al*, 2015[48]	UK	Qualitative study	Acute inpatient setting	4 focus groups 37 consumers 50 nurses	Therapeutic environment	Focus groups	N/A
Seckman *et al*, 2017[49]	USA	Pre/post study	Adolescent psychiatric inpatient facility	1 unit (20-bed)	Sensory room	Month-by-month frequency and durations of restraint/seclusion and number of aggressive behaviours	↓ R/S incidents

Continued

Table 2 Continued

Study (author, year)	Country	Study design	Population/setting	Sample size	Physical design feature	Measures	Reported effects on seclusion and/or restraint
Sivak, 2012[50]	USA	Pre/post study	Inpatient psychiatric facility (rural)	2 inpatient units (one female, one male)	Comfort room	Number of restraints and seclusions, as well as client-to-client assaults and client-to-staff assaults	NS
Smith and Jones, 2014[51]	UK	Mixed methods study	PICU	15 beds (male only) 10 staff members 7 consumers	Sensory room	Seclusion rates were collected 3 months prior to the introduction of the sensory room and 3 months after the introduction. This was followed by semistructured interviews with staff and consumers.	↑ S rates ↓ S (q)
Southard *et al*, 2012[52]	USA	Pre/post study	Acute inpatient setting	81 consumers 25 nursing staff (41 consumers and 12 staff at T1 and 40 consumers and 13 staff at T2)	Enclosed versus open nursing station after renovations	Therapeutic milieu: the Ward Atmosphere Scale (WAS)	↓ R/S (q)
Trzpuc *et al*, 2016[53]	USA	Mixed methods study	Child–adolescent mental health inpatient facility	188 consumers 48 online staff surveys 25 staff interviews (1 unit)	Among other design elements, renovations included a sensory room, quiet room, group room, therapeutic indoor pool in an adjacent (and connected) building and the creation of a nearby, secure outdoor play area.	Staff participated in both qualitative and quantitative aspects of the project, consisting of online survey and interviews. Consumers participated through surveys.	↓ R/S (q)

Continued

Table 2 Continued

Study (author, year)	Country	Study design	Population/setting	Sample size	Physical design feature	Measures	Reported effects on seclusion and/or restraint
Ulrich *et al*, 2018[6]	Sweden	Case–control study	Inpatient psychiatric facility	2 hospitals (1 control)	The new environment has 9 of 10 design features of the Ulrich model and one control hospital with only one design feature.	Compulsory injections and physical restraint, number of consumers and number of incidents	NS (rates) ↓ R (average number of consumers)
van der Schaaf *et al*, 2013[54]	The Netherlands	Retrospective cohort study	Inpatient psychiatric and forensic facility	16 hospitals 199 wards 2446 beds 23 868 admissions 14 834 consumers (from 2 major data sources)	Several design features	115 design features on a ward level, reduced to six main concepts with 14 design features. Three outcome measures concerning seclusion: whether or not an individual was secluded during their admission (risk), the number of seclusion incidents during their admission, the proportion of time they were secluded.	↓ S risk only
Yakov *et al*, 2018[55]	USA	Pre/post study	PICU	1 locked unit (20 beds)	Reducing general sensory stimulation levels between 16:00 and 19:00, which included low lighting and natural light and sound reduction	Percentage of hours in restraints and assault rates between 16:00 and 19:00 and the count or rate of number of assaults per 1000 patient-hours	↓ R (all measures)

*Adapted from Brophy *et al*.[20] .
EssenCES, Essen Climate Evaluation Schema; N/A, not applicable; NS, non-significant; PICU, Psychiatric Intensive Care Unit; (q), reported effect is based on qualitative measures; R, restraint; R/S, restraint and seclusion; S, seclusion.

environment to a prison or a cage for an animal. Furthermore, consumers and their families, friends and other support persons in Australia have identified aspects of the physical environment as a barrier to the reduction of seclusion and restraint.[31] They commented on features such as poor lighting and rooms being bare and cold and there were many criticisms of the environment and of barriers to responding therapeutically in these environments. Their suggestions for improving inpatient environments overwhelmingly involved changes such as non-fluorescent lighting, creating warmth by adding colour, pictures and quotes to walls, sensory modulation and unlocking the doors to the main ward. Two studies showed that simply the availability of a seclusion room was strongly related to the use of both seclusion and restraint.[29 30]

Lastly, one study evaluated consumer and staff perspectives of the therapeutic milieu before and after moving from a closed to an open nursing station.[52] No differences were found in patient or staff perceptions of the therapeutic milieu after moving to an open nursing station. However, they also reported no increase in aggression towards staff and a reduction in seclusion and restraint. Unfortunately, they did not report any data on the latter finding so the effect size is not known.

Sensory and/or comfort rooms

We notice how, in much of the literature, we are constructed as 'disturbed' or 'aggressive' or 'violent' in ways that do not pay attention to the role that environments play or to the contexts in which we find ourselves.

Having a sensory or comfort room to provide a soothing, peaceful space, and the use of sensory modulation techniques to assist with emotion regulation have been identified as contributing to the reduction of seclusion and restraint.[58] Such rooms may be considered an important tool in the goal to reduce seclusion and restraint use.[50] A total of 17 studies concerned a sensory or comfort room in relation to restraint and/or seclusion (see table 2). For some studies, the introduction of the room(s) was part of a broader approach to either improve care or reduce restraint and/or seclusion (eg, sensory modulation approach or a larger renovation project).[4 23 26 36 42 44 53] Most other studies involved, at minimum, staff training accompanying the introduction of the sensory approaches or comfort room(s).[25 27 38 42 47 49] Therefore, any effects on the use of restraint or seclusion cannot solely be ascribed to the introduction of these rooms, though the room is a key component. It can be argued that without training the room may be unused, and conversely that sensory interventions are optimised when they are introduced in a conducive, comfortable space without interruption.

Overall, studies indicated that the introduction of sensory or comfort rooms can reduce the use of restraint and/or seclusion. Interestingly, a study by Blair and colleagues[26] found that even though the incidences of seclusion reduced after renovations (including a comfort room) and changes in practice, such as staff education, the duration of seclusion and restraint increased. Another study reported reduced seclusion and 'full' restraint after the introduction of a sensory room on a child and adolescent psychiatric inpatient unit and an increase in the use of 'partial' restraint.[27] However, this study did not define or describe these terms. Furthermore, one mixed methods study reported an increase in the use of seclusion after the introduction of a sensory room,[51] although when staff were asked about the impact of the sensory room they reported having perceived a decrease in conflict incidents. They also reported an increase in the use of seclusion specifically in the youth mental health unit, after introduction of a sensory room. This indicates the impact of sensory rooms may vary, the way they are used may be an underexamined factor and multiple seclusion and restraint measurements should be considered when evaluating the effects on consumer outcomes.

Private, uncrowded and calm spaces

What it means for us to enter the physical space of a mental health unit is often not spoken about, limiting opportunities for healing. To enter this environment as a consumer one must cross a threshold, both real and metaphorical. It is a space already deeply imbued with cultural and social ideas about having 'lost' minds, rationality and equilibrium. Once we cross the threshold, our testimony, personal capacity and competence may be doubted; this is likely to be experienced as deeply invalidating. Inpatient units often echo messages that reinforce that 'you are not capable' (eg, locked doors, automatic lighting and shared rooms). A bell that can not be unrung. For individuals who have been admitted without their consent, have experienced seclusion and/or restraint or other trauma, simply approaching these spaces could be profoundly distressing.

Several studies indicated the importance of private or quiet spaces, such as no crowding or low-stimulation environments, in reducing the use of restraint and seclusion (see table 2). First, one study reported that no crowding was associated with lower use of restraint.[24] Crowding is an environmental feature that has previously been studied in relation to aggression on psychiatric wards; however, a clear definition is often lacking. It can be understood as either the amount of space per person, the number of people in a physical environment or the perception of crowding.[6 24] In the current study, 'no crowding units' were defined as those in which two of the following three conditions were present: only one bed in a consumer's room, more than 25 m^2 of all-day-accessible space per consumer and the perception of no crowding. Interestingly, a Delphi study indicated that in the absence of private spaces, mental health professionals were more likely to judge seclusion as very necessary.[45] In line with this, a large-scale study involving a multilevel regression analysis with data from 16 psychiatric hospitals[54] showed that the amount of 'privacy' influenced the use of seclusion. A larger number of consumers (varying from a mean of 37.4 consumers to a mean of 52.5 consumers) in the building increased the risk of being secluded. Furthermore, a larger total private space per consumer

(varying from a mean of 12.7 m^2 per consumer to a mean of 14.7 m^2) was related to a reduction of seclusion risk. Other features that were related to reduced risk of seclusion were a higher level of comfort and greater visibility on the ward. However, these features did not impact on the total number of seclusions for those secluded, or the duration of seclusion. The presence of an outdoor space (ie, yes or no) and the availability of special safety measures (eg, such as the presence of special communication and warning systems) were features that *increased* the risk of seclusion. The authors noted that the effect of outdoor space might be biased in their study due to very limited information (eg, type, size and access unknown) and a skewed sample, whereby only 3.5% of the sampled wards did not have an outdoor space.

One longitudinal observation study[55] showed a reduction in restraint after efforts to reduce sensory stimulation levels. This included low and natural lighting and sound and noise reduction (specifically between 16:00 and 19:00). In another qualitative study,[46] nurses from aged persons' psychiatry inpatient units reported that noise (eg, from the TV, radio and dishwasher) and crowded environments, where consumers were unable to avoid noise and stimulation, contributed to the use of restraint and seclusion. Alternatively, having quiet spaces available, such as a garden, activity room or a low-stimulation area, was identified by nurses as an effective alternative to restraint and seclusion. Another qualitative study involving consumers also reported the lack of quiet and private spaces as a contributing factor to poor practices that may increase use of seclusion and restraint.[31]

A recent study by Ulrich and colleagues[6] introduces a conceptual model that promotes a destressing environment in psychiatric facilities, by designing the physical environment with 10 evidence-grounded stress-reducing features. The 10 design features partly overlap with some of the concepts described here, such as designing for low density (no crowding), noise reduction and consumer control over private spaces. To test this model, they conducted a prestudy and poststudy which showed a 50% reduction in physical restraints for consumers who previously required restraint, after relocation to a hospital with most design features in place (9/10 vs 1/10).

DISCUSSION

This rapid review set out to scope the existing literature studying which physical design features of mental health facilities reduce the use of seclusion and physical restraint. Overall, results showed preliminary evidence that the physical environment has a role in supporting the reduction in the use of seclusion and restraint. This is likely to be achieved through a multilayered approach, founded on good general design features that are augmented by trauma-informed design and building towards specific design features that may reduce occurrences of seclusion and restraint. The foundational design principles include privacy, adequate space, no overcrowding, exposure to daylight and other appropriate lighting, use of colour, reduced levels of unpleasant noise, access to gardens, art that features nature, a home-like environment and easy wayfinding.[1 6] An overarching concept is that consumer choice and control, and upholding the human rights of consumers in every instance, is possible through design. This should take precedence over efficiency and general security concerns. We note that broader literature is relevant, addressing the value of good design, having recovery-oriented and trauma-informed environments and providing spaces that enable prevention of aggression, de-escalation and stress reduction.

The findings revealed several overarching themes in design efforts to reduce the use of seclusion and restraint: a beneficial physical environment; sensory and/or comfort rooms; and private and uncrowded/calm spaces. First, findings indicated that efforts towards a more beneficial physical environment can lead to reductions in seclusion and restraint which may be achieved through relatively simple renovations and attention to decor—all the way through to a change of building that enables a modernisation of facilities and ensures access to gardens, recreational spaces and sporting facilities (including a pool).[28 34 39 41 43 53] Similarly, beneficial effects of changes in physical environment in reducing restraint and seclusion have previously been noted by the Victorian Department of Health and Human Services[59] and the Melbourne Social Equity Institute.[60] One study reported a reduction in seclusion and restraint after moving to an open nursing station; however, the authors did not report any actual data on the latter finding.[52] This is in line with staff reporting that a closed nursing station acts as a barrier and creating an 'us and them' environment[61] and evidence showing open staff bays improve consumer–staff access, without reducing staff safety.[62] Rather than designing spacious staff offices that separate consumers and staff, a purposeful design of a sensory retreat space for staff, equivalent to a therapeutic sensory room, is a recent design idea that promotes positive staff–consumer interaction.[63]

Second, the provision of private and calm spaces was a theme across several studies. The findings establish the importance of minimising crowding of inpatient units, of noise reduction and ensuring that people have access to quiet places and rooms over which they have some control. Good design is likely to support the prevention of distress, conflict and/or aggression. As Ulrich and colleagues[6] suggest, changes to physical features may reduce the environmental and psychosocial stressors that can result in consumers experiencing distress. Ultimately, this is likely to result in fewer incidences of restraint and seclusion. The Safewards model[62] identifies the ward environment as a key domain for the generation of potential flash points that lead to conflict and coercive responses. It highlights in principle many more opportunities to prevent seclusion and restraint, using good environmental design as a starting point.

Third, it remains unclear whether sensory or comfort rooms reduce the use of seclusion and/or restraint in and of themselves. For most studies, the introduction of a sensory or comfort room was part of a broader intervention or approach to either improve care or reduce the use of restraint and seclusion. The impact of sensory rooms may vary and robust seclusion and restraint measurements should be considered when evaluating the effects on consumer outcomes.

It is important to acknowledge that the studies identified have limitations and do not fall within the category of robust, rigorous research. This may highlight the complexity of researching physical design features in inpatient mental health units, highly dynamic environments where staffing, models of care and various consumer groups interact and are closely interwoven. As Connellan and colleagues[5] have pointed out, postoccupancy evaluations are rarely carried out and there are varied other difficulties involved, such as cost, fear of negative outcomes and changeability of factors involved (eg, service delivery and budgets). Taking a recovery-oriented approach to mental healthcare is an established expectation for mental health services and the physical environment can contribute to this. Having access to engaging activities and ensuring ease of access for families and other supporters are features that can be facilitated through good ward design and are also likely to contribute to recovery-oriented care.[64] Furthermore, many, perhaps most, of the people who come into an inpatient unit have experienced trauma at some stage in their lives and hence need trauma-informed care. Once again, the physical environment can contribute through the provision of, for example, sensory rooms and soothing décor.[11] The recovery-promoting and trauma-reducing intentions are also conceptually related to the intention to reduce seclusion and restraint, in so far as they prevent staff–consumer conflict and the likelihood of subsequent coercion.[62] More research is required to establish the strength of these relationships. Importantly, future designs should include consumers in a codesign process to maximise the potential for change and innovation that is genuinely guided by the insights of lived experience expertise. Several consumer researcher questions were formulated to guide future research, highlighting the need to consider: consumer codesign, consumer experience, consumer–staff relationships and the rights to freedom of movement (see table 3).

Limitations

The current findings should be interpreted with caution, considering several limitations. First, as mentioned earlier, the critical appraisal indicates that the quality of the studies included is unclear and that the overall quality of reporting was low. As such, the current findings are preliminary and should be interpreted with caution. More rigorous research to establish the direct link between physical environment and a reduction in the use of seclusion and restraint is needed. Second, the consumer voice is often missing from these publications, limiting their quality and utility.

The authors recognise that a priori registration and publication of the study protocol is missing, which was not feasible due to time constraints. It is generally recognised that rapid reviews streamline traditional systematic review methods to synthesise evidence within a shortened timeframe.[65]

CONCLUSION

The design of mental health inpatient units has a complex history. The asylum remains a powerful and archetypal representation of our collective struggle with power, shame and control. Deinstitutionalisation saw many of the original asylums torn down and hastily replaced with hospital-based inpatient units, colocated

Table 3 Consumer researcher questions

Themes	Consumer researcher questions
Consumer codesign	*What codesign processes can be engaged in with consumers, where they have the opportunity to work through the different motivations and how they influence ideas about how inpatient spaces should be designed?*
Consumer experience	*How can design features contribute to spaces that feel welcoming, home-like, allowing consumers maximum personal control over their own private space?*
	How can design features contribute to consumers' sense of being valued and worthy of high-quality care, and capitalise on consumers' personal freedoms?
	What is the role of design in mitigating the strangeness of unfamiliar people and spaces, in which we are perhaps frightened, perplexed, anxious, withdrawn, bored or frustrated?
	How might design features work to support people's freedoms, capability and healing?
Consumer–staff relationships	*In what ways can design features demonstrate respect for the people staying in mental health units (and the people working in them)?*
	How can design features encourage relationships between staff and consumers?
Rights to freedom of movement	*How might design features support voluntary consumers?*

with health services. Consumers have criticised the design of these new facilities as clinical, alienating and distressing. It is likely that the poor design of these spaces contributes to distress and, therefore, increases the use of seclusion and restraint. It is noteworthy that previous designs of inpatient wards have typically not involved consumers.

Overall, we found preliminary evidence that the physical environment can have a role in supporting the reduction in the use of seclusion and restraint. This is likely to be achieved through a multilayered approach, founded on good design features and building towards specific design features which may reduce occurrences of seclusion and restraint. The findings revealed several overarching themes in design efforts to reduce the use of seclusion and restraint: a beneficial physical environment; sensory and/or comfort rooms; and private and uncrowded/calm spaces.

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ORCID iD

Sanne Oostermeijer http://orcid.org/0000-0001-6049-6755

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