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Research and Evaluation Unit

Swedish Prison and Probation Service

HOW ARCHITECTURE AND DESIGN MATTER FOR PRISON SERVICES: A RAPID REVIEW OF THE LITERATURE

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PREFACE

The Swedish Prison and Probation Service (SPPS) is in the midst of a capacity expansion at prisons and remand prisons. Faced with a number of large-scale and long-term investment decisions, the Real-estate Unit at SPPS commissioned the Research and Evaluation Unit to conduct a review of academic literature on how architecture and design matter for inmates at prisons and remand prisons. The purpose of the review was to embed current academic knowledge in policy discussions and ensure that existing evidence relating to the physical environment inform the SPPS' overall strategic concepts Dynamic security and Rehabilitation (*“Bättre ut”*).

Similar expansion challenges are met across Europe and are also the focus of discussion in EuroPris, where the SPPS has an active and influential role. We decided to publish this report in English to contribute to these discussions and the preparation of a joint report in EuroPris Real-estate, set to be published at the turn of the year 2018/2019. The ongoing expansion of Swedish facilities and the current work in EuroPris meant that the review needed to be conducted in a very short period of time.

As both time and the number of high quality studies in this area were limited, the researchers conducted a so-called Rapid review. There are limitations regarding the certainty of the conclusions that can be drawn from these reviews. Few studies are conducted in a Swedish context. However, the findings align with research in relevant areas and also with the experience of practitioners in the SPPS.

There is reason to believe that architecture and design matter for prison services, which is most clearly evident in how the physical environment affects the well-being and social relations in prison. For the SPPS the results align with our policy of supportive environments (*Stödjande miljö*), stating that the physical environment should enable rehabilitation programmes and dynamic security as well as reduce isolation in detention. It is reassuring that existing research mainly point in the direction that we are already heading with projecting new prisons and remand prisons. However, there is room for improvement when it comes to existing remand prisons in particular.

The report was written by Lina Grip, Sofia Caviezel and Elenore Öjes at the Research and Evaluation Unit. The authors would like to thank Maria Hilltorp whose enthusiasm and commitment to the topic has been indicative to the research process. They would also like to extend their thanks to the external and internal referees for their thoughtful comments on earlier drafts.

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SUMMARY

This report reviews the academic research on prison architecture to investigate the role of the physical environment in contemporary prison services. Several literature reviews have previously been conducted on architecture and designs' significance in relevant institutional settings, in particular on health care facilities, and these are summarised in this report. The report adds to the literature by reviewing recent studies on prison architecture.

The authors have used a rapid review method based on a needs assessment developed jointly with the Real-estate Unit at the Swedish Prison and Probation Service (SPPS). Literature searches were conducted in Academic Search Premier, Criminal Justice Abstracts, MEDLINE, and Google scholar. In total, nine literature reviews, 18 journal articles, nine book chapters and one monograph were included in the review. The findings are presented in two thematic synthesizes: the main narrative covering newer studies on prison architecture and a supplementary section summarizing previous literature reviews on broader institutional settings. However the number of studies in this area is scarce, especially studies conducted in a Swedish context, why there are limitations about the certainty of conclusions drawn.

The main findings are that normalized or homely environment and less crowding (in an international perspective) contribute to increased well-being, among both inmates and staff. Layouts benefit from allowing clear oversight and providing natural meetings spots between staff and inmates. Previous literature reviews also show that natural light, or lightning simulating day light, as well as access to nature, can reduce stress and increase well-being. Moreover, prisoners may be more affected by poor physical environments, like crowding, noise and insufficient ventilation, than other groups. This is due to a combination of their previous experiences and habits, long-term exposure to their institutional environment, and lack of control over their physical surroundings, and can result in, for example, insomnia or hostility.

The authors note that SPPS' approach to prison design and architecture is mainly in line with existing research findings. However, standards vary, with remand prisons in particular facing challenges to meet the conditions proposed in the literature. More could also be done to build centralized knowledge on the current status of SPPS' facilities from the point of view of rehabilitative architecture and design within the agency. For example, in terms of monitoring how individual facilities are currently implementing the concept of supportive environments, and in applying best practices to the new expansion of facilities.

SAMMANFATTNING

Så påverkar arkitektur och design kriminalvård: en snabb litteratursammanställning

Rapporten ger en sammanställning över forskning inom ämnet anstaltsarkitektur för att undersöka kunskapsläget om den fysiska miljöns roll inom modern kriminalvård. Ett flertal litteraturöversikter har tidigare gjorts på vikten av den fysiska miljön på välmående inom relevanta institutionella miljöer, så som sjukvård, och dessa sammanfattas i denna rapport. Rapporten syftar till att komplettera tidigare studier som gjorts på området, genom att granska nyare studier om anstaltsarkitektur.

Översikten är av typen ”rapid review”, och har utformats utifrån en behovsbedömning som gjorts i samråd med Fastighetsenheten inom Kriminalvården. Sökningar har gjorts i Academic Search Premier, Criminal Justice Abstracts, MEDLINE och Google scholar. Totalt har nio litteraturöversikter, 18 artiklar, nio bokkapitel samt en monografi inkluderats i översikten. Resultaten presenteras i två tematiska kapitel: den första utgör huvuddelen och innehåller resultat från nyare forskning om anstaltsarkitektur, och den andra kompletterande delen sammanfattar de litteraturöversikter som gjorts inom andra institutionella miljöer. Antalet studier på det här området är relativt begränsat, i synnerhet studier gjorda på svenska förhållanden, varför det finns begränsningar i hur säkra slutsatser som kan dras eller hur de ska översättas till svenska förhållanden.

Rapporten finner stöd för att den fysiska miljön i anstalter och häkten har en inverkan på både välmående och sociala relationer. De främsta resultaten är att en normaliserad eller hemtrevlig miljö och mindre trängsel (sett ur ett internationellt perspektiv) bidrar till ökat välbefinnande bland både intagna och anställda. Planlösningar som gör rum lätta att överblicka och skapar naturliga möteplatser mellan anställda och intagna är att föredra. Tidigare litteraturöversikter fann också att naturligt ljus eller lampor som simulerar dagsljus, liksom tillgång till naturen, kan minska stress och öka välbefinnandet. Vidare finns visst stöd för att intagna påverkas mer utav de negativa effekterna av dåliga miljöer – såsom trångboddhet, hög ljudnivå, och dålig ventilation – än vad andra grupper gör. Detta kan kopplas till en kombination av samspelet mellan deras tidigare livserfarenheter, särskilda situation, lång vistelsetid samt avsaknaden av kontroll över miljön de befinner sig i.

Författarna drar slutsatsen att arkitekturen och designaspekterna inom Kriminalvårdens anstalter och häkten generellt görs i linje med vad forskningen föreslår. Däremot varierar kvalitén något mellan de olika verksamheterna, där häktenas utformning i synnerhet inte uppfyller de krav som stöds av litteraturen. Mer kan också göras för att förena den kunskap som finns om vårdande och rehabiliterande miljöer bland Kriminalvårdens anstalter och häkten. Den kapacitetsutveckling som för tillfället genomförs kan ses som en god möjlighet till att förbättra både den fysiska miljön samt kunskapsnivån gällande vårdande miljöer.

1. INTRODUCTION

The Swedish Prison and Probation Service (SPPS) needs a physical capacity increase by expanding the number of prisons and remand prisons while maintaining – or preferably improving – the quality of services provided. Physical expansion requires meeting unique security needs, keeping costs within reasonable limits and ensuring that the SPPS are able to recruit and retain staff. Furthermore, the physical space needs to allow for a multitude of rehabilitative activities to enable the agency to enhance each client’s opportunities to effectively rehabilitate and re-enter society. The capacity expansion has already begun and focuses on achieving a balance between security and humanism. (Öberg, 20 Feb. 2018) In light of these challenges, the Real-estate Unit commissioned the Research and Evaluation Unit to review the academic literature on architecture and design in relevant institutions to identify research evidence relevant for the SPPS.

Prison architecture and design involves various security aspects, such as ensuring the physical safety of staff and inmates as well as reducing the risk of escapes. In a growing number of other countries, prison services are expected to do more than ensuring safety and security. In the SPPS’ facilities, studies, work, treatment programs and visits by adults and children are daily occurrences. Such activities place demands on architecture and design solutions. The Agency has made a decision to embed supportive architectural and design features within a broader framework called supportive environment (*Stödjande miljö*). While this holistic approach has many advantages, the importance of the physical environment can easily be outweighed when embedded in the development of program activities and the client-close approach. As an example, in the SPPS’ report on supportive environment, only two pages are dedicated to the physical environment. This section of the report is also, to a greater extent than other sections, referring to external research findings rather than experiences from the work within SPPS. (Kriminalvården, 2017)

Academics have in the past, and more recently to a growing extent, underlined the difficulties with implementing current prison treatment programs based on rehabilitation and care within an outdated physical and penal ideological environment. (Hammerlin, 2018: 253) At the same time, Europe has for a long time had a more nuanced approach to prison architecture than might be assumed. In Sweden, the governors have long sought a more human prison service.¹ Over the past decade, research on the broader connection between physical environments and well-being, as well as between architecture and efficiency, in, for example, treatment settings has grown. Scientific articles, primarily from health care, have focused on diverse and specific topics such as lighting, noise levels, furniture, floor plans, etc. Since 2001, at least nine systematic literature reviews on care and rehabilitation environments have been undertaken in psychiatry, social work, health care, youth care, and care for the elderly. One recent study conducted in a Swedish context was Ulrich’s literature review on rehabilitative environments in special youth homes, published in 2017 at the request of the National Board of Institutional Care (SiS). Drawing on existing review studies, the aim of this report is to conduct a complementary literature review on the impact of

¹ See e.g. King Oscar I (1840) *Om straff och straffanstalter* (Eng. translation: *On punishment and penitentiaries*).

the physical environment on rehabilitation within prison and remand prisons. As preliminary literature searches indicated very few relevant studies, a rather broad research question was formed: What role does the physical environment play in a rehabilitative prison service?

2. METHOD

The study is a literature review using the ‘rapid review’ method as described by Grant and Booth (2009) and Khangura et al. (2012). Rapid reviews are a simplified form of literature review compared to systematic reviews conducted in a short timeframe and are primarily designed to meet an existing need on the part of policy makers and administrators. Rapid reviews seek to ‘methodically address a broader scope of scientific evidence quickly’. (Khangura et al., 2012: 1-2) This study follows Khangura’s policy-based reviews (so-called Knowledge to Action Reviews) where the search strategy is preceded by a needs analysis conducted together with the client to define the research question and the practical implications of the study. According to Khangura et al, the search strategy in a rapid review is less comprehensive than in systematic reviews and limited to literature searches in approximately three databases made by one person. The synthesis strategy entails a narrative summary of the results. (Khangura et al., 2012: 3) In a rapid review, the researcher may choose to limit the study by ‘using broader or less sophisticated search strategies, conducting a review of reviews, restricting the amount of grey literature, extracting only key variables and performing only “simple” quality appraisal’. One limitation with rapid reviews is the increase risk for bias in the synthesis, as limiting quality assessment may place a disproportionate emphasis on poorer quality research. (Grant & Booth, 2009: 100) Still, if transparent about the limitations, rapid reviews can serve several purposes. They may serve as informative briefs that prepare stakeholders for discussion on a policy issue, or to support the direction for policy initiatives, or the development of interventions or programs. (Khangura et al., 2012: 1-2) Grant and Booth agree that the analysis of a rapid review is typically narrative and seek to describe quantities of literature and overall quality or direction of effect of existing literature, but not determine the certainty or uncertainty around specific findings. (Grant & Booth, 2009: 94-95) The focus in this review is to describe the findings in the literature rather than valuating the certainty of conclusions, since the number of high quality studies is limited. However, the different study designs and the uncertainty around specific findings are taken into account when drawing conclusions based on this review.

The study commenced with a needs analysis in a meeting between the SPPS project manager, the client (the Real-estate Unit at SPPS) and a scientific advisor from the Research and Evaluation Unit. The need identified was to: review more recent literature on other rehabilitation aspects than those examined in the SiS study (see summary in section IV), with a focus on prison and remand services as well as forensic psychiatric care, in a European context.

In light of the research question “What role does the physical environment play in a rehabilitative prison service?” the inclusion criteria that were used for identifying studies for the main review were: a) staff or clients in prison, remand, or forensic psychiatric care, b) the physical environment’s role in well-being or rehabilitation (measured as reduced recidivism); c) full-text articles or books in English, Danish, Norwegian or Swedish; d) published 1998-2018. Exclusion criteria were: a) crowding or direct observation; b) the new-generation of American prisons. Studies that had already been included in previous literature reviews were excluded. As the number of relevant studies was low, the synthesis was written based on all the relevant articles identified. There were no set quality requirements in the inclusion of articles, as this would make

the sample too small. Instead, the quality, strengths and weaknesses of the articles are acknowledged in the discussion and taken into account when drawing conclusions.

Informed by the needs analysis and the limitations in the research sample, the study also aimed to synthesize existing literature reviews on rehabilitative and care environments as a complement to the search strategy. Preliminary searches identified nine relevant literature reviews from a broad range of institutional and geographical contexts. These institutions in many ways differ from prison and remand prisons and will therefore have limitations in terms of transferability. However, lessons about physical design from institutions with rehabilitation programmes may still provide valuable contributions for future discussions in prison architecture, especially in the absence of such studies in prison contexts. A brief summary of the results from each of the nine identified literature reviews were made and are presented in section III. The quality of the nine literature reviews varied substantially. While four of the reviews met the established criteria for so called systematic literature reviews, two comprehensive reviews fell short of meeting all the criteria of a systematic review, and three reviews had substantial shortcomings with regards to comprehensiveness, selection criteria and transparency of the research process. Subsequently, this report categorizes the nine review articles into three categories of evidence value constructed by the researchers and based on the methodological rigor of the review – in particular the quality assessment of included studies – and the transparency of the research process.

A large number of search terms were used. The search terms related to specific architecture or design features were identified by reviewing the search terms in previous literature reviews. These were combined with search terms related to prisons or incarceration. Searches were made in Academic Search Premier, Criminal Justice Abstracts, MEDLINE, and Google scholar. All search terms and results are described in annex 1.

The searches were made in February and March 2018. Specific searches were during the same period also made in the following academic journals:

Environment and Behavior. Search terms: prison, jail, probation, correctional.

Journal of Offender Rehabilitation. Search term: architecture.

Journal of Scandinavian Studies in Criminology and Crime Prevention. Search terms: architecture, built environment.

European Journal of Criminology: search terms: architecture; built environment.

Building and environment. Search terms: prison, jail, remand center.

In addition, articles' reference lists were searched and the Nordic national agencies for prison service websites were screened for relevant reports. None of these two approaches generated any new studies. In total, nine literature reviews, 18 journal articles, eight book chapters and one monograph were included.

3. PRISON ARCHITECTURE AND DESIGN: A THEMATIC ANALYSIS OF THE LITERATURE

Twenty seven articles and books were included in the review, see Table 1. The content was clustered in the following themes: physical characteristics and design functions (normalization, facility size, noise, light, windows and green spaces) and their impact on people in prisons; design as solutions to challenges associated with imprisonment (incl. prison staff well-being and work efficiency); and the shortcomings of design and architecture in prison services (conflicting discourses, social relations, stressors, different standards of normalization) as well as special needs in prison settings.

Table 1. Studies selected for review

Study	Publication form	Study design and/or method	Sample	Country
Beijersbergen, K. et al. (2016) A Social Building? Prison Architecture and Staff–Prisoner Relationships.	Journal article	Observational cross-sectional, survey	1715 prisoners in 32 remand prisons	The Netherlands
Bierie, D. (2012) Is Tougher Better? The Impact of Physical Prison Conditions on Inmate Violence.	Journal article	Observational cross-sectional, survey	1738 staff in all (114) federal prisons	United States
Bierie, D. (2012) The Impact of Prison Conditions on Staff Well-Being.	Journal article	Observational cross-sectional, survey	1738 staff in all (114) federal prisons	United States
Brottveit, G. (2018) The Becoming of Punishment as an Unpredictable and Moveable Torment.	Book chapter	Qualitative, user-involved research cooperation	1 prisoner’s diary and letters over 4 years	Norway
Clancy, A. and Maguire, M. (2017) Prisoners and their children: An innovative model of ‘whole family’ support.	Journal article	Longitudinal pre-post quasi-experimental	83 benefitting prisoners with families + control group of 76 prisoners	United Kingdom
Dogbeh, A. et al. (2015) Field study of the indoor environment in a Danish prison.	Journal article	Observational, field study and survey	Measurements of indoor climate in 36 cells, survey of 31 prisoner	Denmark
Fransson, E. (2018) The Lunch Table. Prison Architecture, Action-forces and the Young Imprisoned Body.	Book chapter	Qualitative, participant observations, conversations with staff and youths,	30 staff and six youth inmates	Norway

		document review		
Giofrè, F. (2018) Prisons and Architecture. The Italian Framework.	Book chapter	Descriptive, historical narrative analysis	N.A.	Italy
Goudard, A. et al. (2017) Sleep Disorders and Therapeutic Management: A Survey in a French Population of Prisoners.	Journal article	Observational cross-sectional, survey	358 prisoner in one prison	France
Grant and Jewkes (2015) Finally Fit for Purpose: The Evolution of Australian Prison Architecture.	Journal article	Descriptive, historical narrative analysis	N.A.	Australia
Hammerlin, Y. (2018) Materiality, topography, prison and 'human turn'.	Book chapter	Interpretative, critical theoretical analysis	N.A.	Norway
Hancock, P. and Jewkes, Y. (2011) Architectures of incarceration: The spatial pains of imprisonment.	Journal article	Interpretative, critical theoretical analysis	N.A.	Mainly United Kingdom
James, F. (2018) 'It's Important to Not Lose Myself' – Beds, Carceral Design and Women's Everyday Life Within Prison Cells.	Book chapter	Qualitative, participatory observation with interviews	3 prisoner	Norway
John K., (2018) Humanity Rather than Materialism – A Short Essay About the Prison Environment.	Essay, book chapter	Descriptive, narrative account	1 prisoner	Norway
Johnsen, B. (2018) Movement in the Prison Landscape: Leisure Activities – Inside, Outside and In-between.	Book chapter	Qualitative, observations, interview	Multiply observations, interview with 1 prisoner	Norway
Johnsen, B., Granheim, P. K and Helgesen, J. (2011) Exceptional prison conditions and the quality of prison life: Prison size and prison culture in Norwegian closed prisons.	Journal article	Observational, cross-sectional	1132 prisoners + 1078 staff in 32 closed prisons	Norway
Long, C., et al. (2011) Architectural change and the effects on the perceptions of the ward environment in a medium secure unit for women.	Journal article	Longitudinal pre-post non-experimental	9 patients and 16 staff in one unit	United Kingdom
Madoc-Jones, et al. (2016) Prison Building Does Size matter? A Re-Assessment.	Journal article	Observational, cross-sectional	124 HMI Prison reports on the conditions and treatment of	United Kingdom

			prisoners	
Shammas, V.L. (2014), The pains of freedom: Assessing the ambiguity of Scandinavian penal exceptionalism on Norway's Prison Island.	Journal article	Qualitative, observations and semi-structured interviews	15 prisoner and unknown number of staff	Norway
Rice, J. and Lremy, L. (1998) Impact of Horticultural Therapy on Psychosocial Functioning Among Urban Jail Inmates.	Journal article	Longitudinal time series pre-post experimental	57 prisoners	United States
Rice, T. (2016) Sounds inside: prison, prisoners and acoustical agency.	Journal article	Descriptive, textual analysis	4 prisoners' personal text collections	United Kingdom
Richards, H. and Kafami, D. (1999) Impact of Horticultural Therapy on Vulnerability and Resistance to Substance Abuse Among Incarcerated Offenders.	Journal article	Longitudinal pre-post non-experimental	33 prisoners with substance abuse	United States
Söderlund, J. and Newman, P. (2017) Improving Mental Health in Prisons Through Biophilic Design.	Journal article	Descriptive, summarizing literature and practices	N.A.	N.A.
Tartaro, C. and Levy, M. (2008), Predictors of Suicide in New Generation Jails.	Journal article	Observational, cross-sectional	150 prisons	United States
Trusiani, E. and D'Onofrio, R. (2018) Prisons, cities, and urban planning: the Rebibbia prison in Rome.	Book chapter	Descriptive, description of prison site	1 prison	Italy
Vaaler AE and Morken G (2005), Effects of different interior decorations in the seclusion area of a psychiatric acute ward.	Journal article	Cross-sectional post-test only quasi-experimental	31 patients + 25 in control group. Follow-up evaluation on 200 patients	Norway
Wener, R. (2012). The environmental psychology of prisons and jails: creating humane spaces in secure settings.	Monograph	Descriptive, literature summary	N.A.	Mainly United States

Physical characteristics and design functions

Normalization

The assumption of normalization is that a normalized interior design will mitigate institutionalization and aid rehabilitation and reintegration for clients in closed security institutions. Normalization has been adopted as a key principle in Scandinavian prison policy, including in its architectural and interior design. (see e.g. Fransson, 2018: 187; Hammerlin, 2018) The earlier dominant view of closed institutions, which derived from psychological research, instead emphasized the necessity of sensory deprivation in institutional design. Mental health care facilities, for instance, were thought to benefit from ‘stripped’ environments that calmed the patients by avoiding external stimulations and stressors. Few studies had however tested this assumption. (Long et al., 2011: 209; Vaaler, Morken & Linaker, 2005: 19; Wener, 2012: 164-165) This approach dominated the design of, for example, seclusion areas in acute psychiatric wards. As a result these were typically sparsely furnished, lacked curtains, paintings, decoration as well as TV, radio, newspapers and flowers. A few more recent studies have challenged the traditional approach and found that normalized or ‘more homely’ design features may be ‘associated with favorable perceptions of atmosphere’ at closed institutions and ‘have therapeutic value’. (Vaaler, Morken & Linaker, 2005: 19-20) Tartaro et al. (2008) used bivariate analysis and logistic regression and found that those US prisons with a less institutional, more comfortable, living environment, and where inmates could control lighting and walk in and out of their rooms when they wanted, were less likely to report at least one inmate suicide. Their findings suggested that the use of design to transform prisons into less traditionally institutional and more ‘normalized’ could be beneficial in terms of suicide reduction. (Tartaro, Levy & Stockton, 2008: 33) Vaaler et al. (2005) conducted a controlled, post-occupancy evaluation study of the refurbishment of Østmarka hospital’s acute psychiatric ward in Norway. In the experiment, one wing of the ward was redecorated like an ordinary Norwegian home (to the extent possible based on security needs) while the other wing maintained a traditional stripped interior. During a period of four months, 31 patients in the Homely wing and 25 patients in the Stripped wing were monitored with regards to their symptoms, functioning and behavior. The patients had various diagnoses and there were no significant differences in the group compositions. During the test period, the ward redesign had no significant effect on patients, yet, there was a slight decrease in vandalism in the Homely wing. Also, women were more positive to the new interior compared to men. Over the following two year period, there was no case of vandalism in the Homely wing which during this period held 200 patients. This led the researchers to conclude that ‘Well-kept and familiar surroundings seem to lower vandalism in the seclusion area’, and to argue for a shift away from traditional stimulus-reducing interior to more homely interior design concepts in similar institutions. (Vaaler, Morken & Linaker, 2005: 22-24)

Long et al.’s small study (n=9) of female patients’ perceptions of the ward environment in a medium security unit following design change, similarly found that a normalized interior design was associated with higher patient satisfaction, a reduction in overall symptomology, anxiety and guilt, and no change in misbehavior. (Long et al, 2011: 209) The new building, however, incorporated views and outdoor green spaces, changes to lighting, textiles and furniture, as well as changes to the layout and additional space for activities and more personal space. (Long et al,

2011: 206) As many design changes occurred at the same time, it is not possible to determine which, if any, of the changes was the most effective.

Clancy and Maguire (2017) have conducted an outcome evaluation on a design intervention aiming to improve parent-children relations in the Parc prison in Wales. The prison runs the largest family-focused support program in the UK, targeting prisoners, their partners and children. To facilitate the program, the main visit hall underwent extensive refurbishment, producing a more normalized environment, including a colorful children's play area. In addition, a 'Family Interventions Lounge' –a homely room allowing prisoners and their families to meet more privately during family visits – was created. A new visitor center was built outside the prison gates for visitors to stay in. The center was purpose-built as a child and family-friendly environment, by using, for example, plants, color and art. (Clancy & Maguire, 2017: 215-216) The evaluation found the program to be successful in improving support to families, family relations and well-being. The program included more involvement from staff, more substantial interventions and new activities run by a children's charity. Hence, the importance of the physical environment in the successful outcome of the program is difficult to determine and may have played a limited role. Furthermore, the evaluation did not measure the role of the physical space and purpose-made design. Yet several references were made to these features in the interviews. Interviewees listed the physical experience of family visits as one necessary aspect that facilitated the program, and the perception that 'An establishment is much more likely to shift its culture if a family-focused wing is in place.' (Clancy & Maguire, 2017: 225)

Johnsen (2018: 81) similarly argues that a rehabilitation and care concept to prison design needs to take a more relational rather than a strictly technical approach, and be embedded in broader programs: 'It is easier to recognize the value of green places, gym facilities, music rooms and so on, and the value of allowing extended use of these facilities if they are incorporated into assemblages of normalization ... a music studio might be used to record music, like a lullaby, and sent to the prisoners' children so they can hear dad or mum singing before they go asleep.' Taking part in leisure activities, like family visits, is one part of normalization, with 'the idea that prisoners engage in leisure activities for the same reasons that people outside the prison do. Just as other people outside do, prisoners exercise, play music and so on for their own benefit or pleasure.' (Johnsen, 2018: 81) According to Trusiani and D'Onofrio, a further extension of normalization can be developed by building closer links between prisons and the local community on the outside. In Italy, the nursery section of Rebibbia Women's Prison houses mothers with children under the age of three. As one aspect of care and extended normalization, children regularly attend the city nursery schools outside the prison, despite their official temporary residence in the prison that their mothers are incarcerated at. (Trusiani & D'Onofrio, 2018: 94-95)

Facility size and layout

The importance of facility size and layout has mainly been covered in the Ulrich literature review, and only a few newer studies from Europe will therefore be include here. The findings from Ulrich (2017) concluded that prisons with layouts that support direct contact between staff and inmates showed more beneficial outcomes (see previous chapter). Johansen et al. also argue that

humane prison conditions, measured as positive perceptions of the quality of prison life for those who live and work in them, tend to be found in smaller prisons in Norway. (Johansen et al., 2011: 527) A large survey study of prisoners in remand prisons in the Netherlands found, contrary to the researchers' hypothesis, that the largest facilities did not have the most negative outcomes with regards to staff-inmates relations. Prisoners staying in the facilities of panopticon prison design (the second largest type) felt most negative about their relations to the staff, when controlling for other factors. This may be linked to the general large size of the facilities. Compared to the Dutch average and the average size of the Norwegian or Swedish remand prisons, those facilities with the lowest scores are still large facilities, on average hosting 322 prisoners. (Beijersbergen 2016: 861). The general layouts of the panopticon prisons in the Netherlands are consistent with the older prisons in the USA, in that they emphasize staff surveillance, control and discipline of prisoners. Panopticon prisons are circular with a domed roof and cells arranged in tiers around the circle. The center of the building has an 'inspection house' from which the staff is able to observe all prisoners of the facility without prisoners knowing whether they were being watched. (Beijersbergen 2016: 847) Double bunking was also most common in the panopticon prisons. (Beijersbergen 2016: 862-863) The units with this design were also the oldest. All such units were built in the 19th century, which likely affects, for example, acoustics. (Beijersbergen 2016: 861) The study therefore supports the assumption that design choices can reduce feelings of privacy, increase social density among the inmates and generate a distance between staff and inmates. (see Ulrich, 2017)

Madoc-Jones et al. (2016) measured outcomes for prisoners in various sized facilities in the UK to explore the effects of prison size on performance. They found that prison size was statistically associated with the assessment of a healthy prison (as defined in the HMI Prisons Inspectors), with smaller prisons doing better. The authors concluded that larger prisons may have a negative impact on staff-prisoner relationships which can lead to negative outcomes in prisons. However, they also identified well functioning larger prisons and poorly performing smaller prisons. (Madoc-Jones et al., 2016: 9-10) Like the Dutch study, the definition of small and large facilities may have affected the findings: in the case of Madoc-Jones et al. smaller prisons are those with less than 400 prisoners which, by Scandinavian standards, would be exceptionally large. These facilities, on average, performed well in regards to safety, respect and purposeful activity. The authors, like Beijersbergen, found that the age of the prison mattered with prisons built before 1938, on average, scoring below the median on all measures. (Madoc-Jones et al., 2016: 7-8)

Sound

Wener (2012) reviewed the literature on noise and its effect on prison environments in his book *The environmental psychology of prisons and jails: creating humane spaces in secure settings*. He argued that prisons are often loud due to large, open interior spaces with high ceilings and extensive use of hard materials and surfaces, such as concrete, glass and metal. This in combination with little use of textiles and other sound-absorbing materials, create high volumes and large reverberation times, generating uncomfortable echoing. Furthermore, constant mechanical sources of sound from, for example, heating, cooling and ventilation can add significant background hums. (Wener, 2012: 191, 193) Prisons typically house large numbers of people. A variety of activities need to be performed, including therapy and education. At a minimum, prisons are obliged to

follow legislation relating to maximum noise level for the various settings (school, residential homes, etc.). Noise may also influence the quality of such activities, including the ability to successfully engage in educational and rehabilitative programs. Noise can significantly impact on mood, motivation and behavior. This could affect levels of tension, stress and well-being as well as affect task performance, learning and communication. (Wener, 2012: 196-198) Noise may also have negative physical effects, including hearing loss or a loss of sensitivity to sounds, nausea, headaches, hypertension, elevated blood pressure and increased release of stress hormones. (Wener, 2012: 194, 196) Importantly, noise levels in a prison environment are likely to be entangled with other stressful conditions, like crowding. Exposure to multiple stressors may increase their overall negative effect on the individual. (Wener, 2012: 196-197) Moreover, a lack of predictability and control over noise generate more stress than loudness. Unpredictability and lack of control have been found to reduce motivation for task completion and lead to greater aggression among people previously angered or provoked. (Wener, 2012: 195-196) In prison, both inmates and staff often perceive themselves as having little ability to control the level of or exposure to noise and there may be no place to withdraw. (Wener, 2012: 193)

Noise can lead to sleep deprivation and directly affect the quality of sleep. Repeated exposure to noise can also increase heart rate and blood pressure during sleep. (Wener, 2012: 194) A meta-analysis of 143 sleep deprivation studies by Pilcher and Huffcutt (1996) concluded that sleep deprivation has powerful negative effects on human functioning and especially on mood. This result was supported by Ireland and Culpin (2006) that found a negative relationship between quantity and quality of sleep and aggressive behavior among incarcerated adolescent males. (Both ref. in Wener, 2012: 194) In a French study, poor sleep in prison was reported to be partly caused by the physical environment: with two thirds of 'bad sleepers' reported noise as the cause (the second most common cause), followed by temperature (40 %) and light (17 %). The most commonly reported cause, however, was thought rumination, a classic 'pains of imprisonment' (Sykes, 1958), not generated by the physical environment. Certain behaviors of the inmates, primarily smoking and late night TV-watching, also lead to poorer sleep. (Gourdard et al., 2017: 197)

According to Rice, the physical and visual restrictions in prison do not relate to acoustics, which often is porous, making sound travel through and into the building. (Rice, 2016: 12) Rice argues that prisoners have acoustical agency to a larger extent than is typically acknowledged in the literature: 'Rather than simply being passively absorbent of unpleasant noise, then, prisoners are also active and resourceful listeners to and interpreters of sound.' (Rice, 2016: 7) Through listening, prisoners may reduce uncertainty by, for example, gaining information about planned activities, or if a staff or prisoner is approaching, etc. (Rice, 2016: 12) Through 'acoustical relationality' inmates use their hearing to make sense of a place and a space. Listening to music with headphones can be a way for prisoners to influence their own soundscape, as a retreat from others and a strategy to deal with emotions. (Rice, 2016: 7)

Light and lighting

While light and lighting were recurring themes in the literature reviews (summarized in the next section), only one of the articles on prison services, by Wener, discusses these themes specifically. Because studies on light and lighting in prison environments appear to be lacking, Wener's book chapter draws on literature from other settings, either other closed institutions, or, more commonly, to general populations. (Wener, 2012: 204) Several studies have found that exposure to natural light has a positive impact on physical and mental health, recovery and well-being among hospital patients. Significant features include windows and rooms on the bright side of a hospital. While these studies have emphasized the importance of natural light, there is increasing evidence that appropriate artificial lighting can have positive effects, comparable to those received from daylight. (Wener, 2012: 210) The long-term incarceration in prisons makes it especially important to consider artificial light both as a compliment to, and a substitute for, natural light. (Wener, 2012: 207)

Exposure to natural light plays an important role in setting and maintaining the body's biological clock (so called circadian rhythms). Disruption of circadian rhythms may affect hormone regulation and can have short- and long-term health consequences. Inadequate exposure can also lead to vitamin D deficiency and depression. (Wener, 2012: 209) Lack of daylight and insufficient darkening at night can, like noise, affect the quality of inmate sleep. Exposure to light during night-time inhibits the production of melatonin, which affects sleepiness. (Wener, 2012: 229) Chronic sleep problems can have a negative impact on health, by increasing stress and social problems, and by leading to unhealthy behaviors (increased smoking, poor diet, and less exercise). Risks associated with insomnia also include reduced alertness and impaired performance, which may led to a significant increase in the risk of accidents and injury. (Wener, 2012: 212) Lighting design that mimics daylight changes helps the body to maintain circadian rhythms. Avoiding static lighting can also help break the monotony experienced in many artificially-lit places, especially in closed institutional environments. Variations in indoor lighting levels and spectra can have a positive impact on cognitive performance and mood. (Wener, 2012: 209) Addressing circadian needs with blue lights of sufficient intensity would likely be seen as unpleasant and insufficient for task performance. (Wener, 2012: 211) Nature views and daylight can affect satisfaction, health, irritability, aggressiveness, mental function, problem solving, stress responses and recovery, and even levels of violence. Poor access to daylight and inadequate artificial lighting may affect staff alertness and mood, especially given the increased stresses associated with shift work. (Wener, 2012: 229)

Color has in the past been assumed to have significant impact on mood, and following the approach of 'stripped' institutional environments, design choices often included color schemes of blue and green that were thought to calm patients. Wener however argues that changing the wall color is unlikely to be a silver-bullet. First, there is little evidence that colors have general psychological and behavioral effects. (Wener, 2012: 225, 227) Context and individual differences appear to play important roles. So-called low-stimulus screeners (people who are more easily aroused and more easily distracted by environmental stimulation) may react differently to a color compared to high-stimulus screeners, and the effects appear to be reactive and passing. Nonetheless, color decisions may impact on the overall space. For example, the choice of color will affect the brightness of a room. Certain color and monochromatic surfaces can contribute to

how institutional or homely a room is perceived. Color can also be used in a design plan aiming to counteract the monotony and boredom of a place, or reflect natural elements that can have positive psychological effects. (Wener, 2012: 228)

Windows, views and temperature

Most people have strong preferences for windows in many kinds of settings. (Wener, 2012: 216) Functions of windows include providing visual variety and the potential for psychological escape and can, therefore, mitigate negative aspects of prison life, including boredom and isolation. (Wener, 2012: 214) A study by Wener and Olsen (1980) found that windows in a prison were highly valued for activity and distraction (Wener & Olsen, 1980 ref. in Wener 2012: 217) Windows with a view provide a source of activity and distraction from monotony. Views, especially of nature scenes, may reduce boredom and stress as well as provide mental relief, restoration and recovery. (Wener, 2012: 214, 218) Windows can also break feelings of isolation by providing a connection to the outside world. (Wener, 2012: 204) Access to views of nature through windows may be particularly important in closed institutions where access to nature is limited. Moore (1985) showed that inmates with external views of nature had reduced blood pressure and used institutional health care facilities less, when compared to inmates who had only views of courtyards. (ref. in Wener, 2012: 223) Windows in intensive care settings have been found to significantly reduce depression, anxiety and post-treatment delirium. Nature scenes combined with nature sounds have successfully reduced pain in patients. (Wener, 2012: 218)

There are also negative aspects of windows that relate to temperature and exposure. (Wener, 2012: 215) A prisoner at Halden prison in Norway – a facility built with large glass windows – witnessed that the private rooms were uncomfortably hot in summer. (John K, 2018) A Danish study of the indoor climate at a remand center in Copenhagen measured air temperature, relative humidity and carbon dioxide concentration (CO₂) and recorded the inmates' assessment of their indoor environment through a questionnaire. (Dogbeh et al., 2015: 21) The study found that 25 percent of all recorded temperatures in the cells were over 28°C, which is much higher than the Danish standard and above the max comfort temperature of 27 °C. The temperature was not even across the cells: in 19 of 35 cells the temperature exceeded 27°C more than half of the time. Ventilation in the cells was very poor. The CO₂ concentrations rose sharply at night time when the cell door closed. The researchers found a significant difference between the rooms where the inmates slept with an open window compared to rooms with closed windows, which reach a concentration of 4000 parts per million (ppm) overnight (the recommendation is max 1000 ppm). Thus, natural airflow in the rooms was very poor with doors and windows shut and the inmates' behavior of window opening was crucial for the air quality. Dogbeh et al. further found that prisoners in remand prisons likely have different needs compared to a general population with regards to indoor temperature, humidity and CO₂ concentrations. First, the prisoners spend a lot of time in their rooms; the average time spent in the cell was 19 hours per day (range 12-23 h). Secondly, the group smokes extensively. Of the 31 inmates in the sample, 74 percent were smokers. In the smokers group, 30 percent always smoked in their cell and 39 percent smoked more often in their cell than outside the cell. (Dogbeh, 2015: 23) Thirdly, prisoners have a different level of control over their environment, and the standard comfort range was established based on people who have more control over their environment. "Therefore, it is possible that

the upper limit of the comfort range for the inmates in the prison was lower than the recommended 27 °C'. (Dogbeh, 2015: 25) The study also found that inmates frequently attempted to take control over their environment: 'Many inmates, especially those occupying cells oriented towards southeast and southwest, tried to block the incoming sunlight during hot days. No external shading was installed and the curtains, which were too short for the new windows, were sometimes missing. As a result, many inmates used towels, cloths and bed sheets as internal shading.' (Dogbeh, 2015: 24)

Windows without blinds or curtains also have the disadvantage to allow views into the room from the outside. Being visually exposed through windows is considered unpleasant. Adjustable window blinds help inmates regulate both temperature and exposure from the outside. (Wener, 2012: 215) Lighting, windows, views, and color are closely interconnected in ways that make it easy to confuse, confound, and conflate key findings. It is not easy to control or account for which element is most important. (Wener, 2012: 206)

Green spaces, gardening, biophilic design and horticultural therapy

Experiences of nature, even via photographs and films, have been found to improve cognitive performance and attentional capacity, and to reduce anxiety and stress. Nature scenes have also helped patients dealing with pain, aided in recovery from health issues, and reduced blood pressure and heart rate. (Wener, 2012: 225) Views of nature tend to improve life satisfaction and may reduce aggressive behavior. (Wener, 2012: 219) Having access to green spaces- physically or visually- provides distraction, and may help reduce mental fatigue, which is a risk in environments that are monotonous or unpleasant. Mental fatigue can lead to anger, irritability, aggressive behavior, poorer thought processes, and reduced impulse control. Access to small green spaces have, for example, been associated with improved attention span and lower rates of aggressiveness. (Wener, 2012: 220, 222) Nature views can be restorative and may be especially useful when people seek to restore calm after experiencing threatening or, in other ways, emotionally difficult events. One study showed that the positive effect of nature views was strongest where inmate turnover was the highest. Population turnover in closed institutions can add stress to the unit and may lead to increased aggression. (Wener, 2012: 223)

The use of green spaces is sometimes referred to as 'biophilic design'. Originally seeking to bring nature into city residents' daily life to enable positive physiological and psychological outcomes, biophilic design can be extended to people in closed institutional environments. (Söderlund & Newman, 2017: 750) Biophilic design includes the use of fractal patterns (self-replicating patterns that occur at increasingly smaller magnification), refuge (a place where one feels safe), prospect (view or window out of the place of refuge) and greenery. (Söderlund & Newman, 2017: 761 - 766) The biophilia hypothesis assumes that exposure to nature reduces stress and contributes to rapid stress recovery. The incorporation of biophilic initiatives within prison design is an emerging field. Söderlund and Newland found that images of nature, including wall posters and the screening of nature movies, have been incorporated in some prison facilities in United States. Other examples from Australia include using green walls, plants, and green houses for the production of the food for the inmates. (Söderlund & Newman, 2017: 766)

Horticultural therapy has been defined as the experience of plants between the therapist and the patient. (Richards & Kafami, 1999: 184) Horticultural therapy may take the forms of imagining nature, viewing nature, visiting a healing garden, and gardening. It is expected to facilitate healing, alleviate stress, increase well-being, and promote participation in social life and re-employment for people with mental or physical illness. It has been used in, for example, Danderyd hospital rehabilitation clinic in Sweden with patients in rehabilitation following brain damage. (Söderback, Söderström & Schäländer, 2004: 245) Richards and Kafami (1999) measured the influence of a horticultural therapy program on San Francisco county jail inmates' psychological and social functioning during treatment and on return to the community. They found that horticultural therapy reduced vulnerability to addiction (incl. psychological symptoms, tension and distress) which led to reduce drug use among participants; however the program had no significant impact on building resistance to addiction among the participants (measured as increased sense of self-efficacy, positive expectations, and confidence in one's coping skills). (Richards & Kafami, 1999: 175)

The promise of design solutions

Existing studies on the use of normalized interior and green spaces indicate that design and architecture may significantly affect prison services. Bierie (2012) studied the relationship between physical prison environments and serious violent incidents in American prisons. He used data from an annual staff survey conducted in USA Federal Prison facilities. The data show that violence declines significantly as the quality of physical conditions improve (noise, dilapidation, privacy, etc.). (Bierie, 2012: 346) The data further showed that inmate violence was significantly lower in prisons with better physical environment. The results held independent of staff characteristics and other structural factors that the literature suggests influence motivation toward, or opportunity to, engage in serious violence (e.g., staff-inmate ratio, crowding, and security level). (Bierie, 2012: 349) A problematic assumption is that the survey responses from staff correctly reflected actual conditions in the inmates' physical environment as perceived by inmates. Such assumptions included the level of privacy and noise in inmates housing units during the evening and night time. (Bierie, 2012: 343)

Several studies have found that some negative consequences associated with imprisonment can be mitigated by design choices. According to Bierie, small investments in physical conditions, such as providing headphones for inmates' televisions, would reduce the general noise level and associated stress. (Bierie, 2012a: 351) Albeit more expensive, James questions why prisons have not adopted compact-living designs developed for recreational spaces, like boats, to allow for transformations of small spaces that follow the circadian rhythm. Sofabeds, for example, would allow for a differentiation between daytime and nighttime and make the room more homely. (James, 2018: 172) He notes however, that because most of these solutions have been developed in sectors without a great need for security, existing models might need to be modified before being introduced in prison settings. (James, 2018: 173)

Prison design may have enabling or facilitating qualities. 'Supportive design' is design that helps achieve the goals of the organization. In a prison environment, this could translate to design choices that help to reduce stress, agitation, irritation and aggression whilst also increasing positive interaction and learning. (Wener, 2012: 223-224) According to Hammerlin, 'small open

prisons with liberal regimes often develop an institutional character which permits various positive activities that are dominant and related to the local environment.’ (Hammerlin, 2018: 260) Prison design choices may mitigate inmates’ experiences of social, emotional and material losses associated with imprisonment (including the loss of power, freedom, relationships, loss of objects, etc.). A study of a forensic psychiatric care facility in Sweden found that the approach to the physical environment was thought to compensate somewhat for the damage that high security institutions are known to inflict. (James, 2018: 155-156) This approach has also been adopted in the Norwegian prison system, through a prison design ideology of rehabilitation and care. The rehabilitation and care-ideology has two rationales: to reduce the harmful effects of a term in prison; and to help the prisoner acquire skills that will enable him or her to live a non-criminal life integrated in society when released from prison. (Hammerlin, 2018: 253) The assumption is that: ‘Materials, architecture and interiors can lay the groundwork for a number of positive measures in specially adapted spaces’. (Hammerlin, 2018: 260) Hence, the concept of supportive design does not suggest that technical or artistic solutions provide any silver bullet or that they even have a significant independent impact on prisoners, but that the importance of design is to mitigate the pains of imprisonment and enable rehabilitative practices.

Prison staff well-being and work efficiency

For staff, improved satisfaction with the physical work environment may improve workplace efficiency, increase job commitment and reduce staff turnover. (Bierie, 2012b: 93) Bierie has studied the effect of intrusive noise, clutter and dilapidation in prisons on staff well-being. He found that harsher conditions were associated with reduced well-being, measured in sick leave use; change in alcohol and tobacco use; somatic symptomology; psychological symptomology; and personal worries. (Bierie, 2012b: 89) Staff members who perceived harsher prison conditions consumed more alcohol and smoked more often in the prior six months. They were significantly more worried about aspects of their life outside of prison (e.g., money) and reported significantly higher psychological problems (e.g., concentration problems, depression). They also exhibited more physical problems, such as headaches, stomach aches and back pain. Prisons with better than average conditions did not observe nearly the same problems among staff, even if an individual staff member perceived poor conditions. (Bierie, 2012b: 92)

The physical environment may have an important influence on job satisfaction and commitment. A survey of office workers showed that there was a direct and positive effect of natural sunlight on job satisfaction, intent to quit, and well-being, although there was no effect for overall lighting. (Wener, 2012: 210) Noise can have significant effects on task performance, increase the likelihood of accidents on the job, as well as impair the level of cognitive functioning, including memory, reading, and vigilance. (Wener, 2012: 195) Prison staff in the USA have previously rated the noise levels as a concern and indicated that noise contributed to tension. (Wener, 2012: 198) Noise may also increase work stress, reduce job satisfaction, reduce attachment to the organization, and, in turn, increase turnover of officers. (Wener, 2012: 195) The added pressure of accomplishing tasks that are hindered by these conditions may generate additional strain and duress for staff. For example, intrusive noise, clutter and shabbiness is unpleasant for staff, and makes it more difficult for them to communicate and monitor inmates or their own safety. (Bierie, 2012b: 83) This may be particularly true if conditions also affect inmates, leading to

additional workload pressure for staff members who must then control a stressed prison population. (Bierie, 2012b: 93)

The limits to design solutions

Conflicting discourses

Several authors have approached prison architecture through discourses or discursive practices, arguing that design solutions must be extended to include prevailing discourses within the prisons. Prison design is not generated independently by technocrats but to a large extent determined by the cultural and social value given to prisons by society. (Giofrè, 2018: 103; Johnsen, 2018: 66) Prison architecture thus has symbolic and communication purposes. By diverging design choices, states may through prison design portray themselves as progressive, humanistic, rational, functional, etc. (Hancock & Jewkes, 2011: 617) The Nordic prison architecture has been associated with exceptionalism in the overall prison conditions, based on humanism and egalitarianism, with comparatively high material standards and characterized by, for example, their 'normality', high staff ratio, and closeness to outside communities. (Pratt, 2008) The Scandinavian prison architecture is, however, no less political or symbolic in its design. (Hancock & Jewkes, 2011: 626) Emerging research on 'humane' prisons tends to emphasize prison ideology and practice, and situate these in relation to discourses behind punishment. This research includes, for example, a number of ethnographic studies in Norwegian prisons. (Brottveit, 2018: 204) Fransson argues that the development of prison architecture in Norway is an extension of the country's overall approach to prison services: 'The prison space is meant to communicate an informal, aesthetic and caring atmosphere reflecting the ethical values of the Norwegian penal system based on humanistic principles, normalization, citizens' rights, rehabilitation, help and care, and with the best interests of the child at its core ... they are meant to reflect progress, humanism and lead one to think that prisons could be something more than just repressive institutions'. (Fransson, 2018: 187) Such discourse seems however to be in conflict with discursive practices within prisons. Inmates are reminded of their imprisonment by daily routines, or a lack thereof. Such practices include randomized control checks of cells and views of natural surroundings and green spaces that inmates cannot access: 'the designed objects and interiors represent and speak the language of punishment however "normal" they may be.' (James, 2018: 154; Brottveit, 2018: 202) James argues that regardless of how normalized or personal the prison space is, it is impossible to escape reality within prison 'if architecture and design repeatedly draw attention to its penal ideology.' (James, 2018: 164) According to Hancock and Jewkes, prisons still seek to communicate control, order, and power, with the purpose to secure the compliance of individuals. Prison architecture conveys messages about the individuals confined within them, their supposed characteristics, and how they are expected to behave. (Hancock & Jewkes, 2011: 624, 626) Restrictions in space, lights, and color, are linked to the production of an institutionalized mode of subjectivity; one consistent with the demands of docility and dependency continually placed upon the prison population. (Hancock & Jewkes, 2011: 617) Moreover, the constant use of technologies to monitor and control the prisoners also contributes to such discourses. (Hancock & Jewkes, 2011: 622, 624)

According to Johnsen, one could work with the discursive practices of prison architecture to meet the goals of more humane and progressive prisons. One aspect of such a design approach is to work with deterritorialization of activities, as part of the process of normalization. Activities that entail restrictions in movement by physical borders and rules are likely to be permeated by feelings of imprisonment, even when the purpose is normalization. One example given is that of leisure time. Leisure time in Halden prison in Norway is, according to Johnsen, driven by safety and security considerations, leading to bonded and territorialized activities. Deterritorialization could entail freer movement within the landscape of a closed prison, as well as looser or more open definitions of the functions of a place. (Johnsen, 2018: 70) Giofrè similarly argues for a broader approach to prison architecture that sees the prison 'as a place to promote the prisoner's human respect, a place of rehabilitation for the persons experiencing it, and a place in a close relationship with the cultural, social, and physical setting it belongs to'. (Giofrè, 2018: 126) While the intentions might be there, they may be lost in everyday practices. Moreover, the original design may not be liaised with the end-users, that is, inmates and staff (Hancock & Jewkes, 2011: 623)

Social relations

One of the shortcomings of prison design solutions is that a focus on technical responses may downplay the role of social relations between prisoners and staff and how these are produced by the prison environment. Social relations in prisons are dynamic processes while the physical architecture is fixed, hence, the interpretation and experience of the same physical space will be different and partly depend on the social relations within that space. (Brottveit, 2018: 204; Hancock & Jewkes, 2011: 623) The relationship between prisoners and staff is, according to Johansen et al., the most important factor in how prisoners experience their term. This relationship is a major determinant for the inmates' perception of the quality of prison life and outweighs material aspects of prison quality. To a large extent, perceptions of the physical dimensions of prison life are influenced by the quality of this relationship. (Johansen et al., 2011: 523) Understanding prison design should therefore go beyond the physical space and involve interactions in that space; including how architecture is experienced, communicates with the people inside, and influences staff and prisoners. (Fransson, 2018: 178) From this point of view, it is possible that studies of architectural features may have concealed differences in staff-client relations. This might be the case in, for example, some of the studies of the differences in layout and floor plans in the Direct Supervision jails in the USA compared to other facilities, where the transformation to direct-supervision had large impacts on staff-inmate relations and included, for example, staff training on how to relate to the prisoners. (Wener, 2006) Given the above emphasis on discourses, different design choices in building more humane and less repressive institutions would be mirrored in staff training and approach to prisoners. Nonetheless, the design of a prison can also affect levels of social interaction between staff and prisoners as well as the way in which staff and prisoners interact. Beijersbergen's survey study (2016) found that prisoners in remand prisons in the Netherlands had significantly different perceptions of staff-inmate relations depending on the type of facility they lived in. The different facilities are located in the same compound, so divergence in, for example, national prison policy should be minimal. Rather, it seems that some facilities created a more hierarchical and physical distance between staff and inmates, which influenced the prisoners' perceptions. Grant and Jewkes further argue

that changes in the physical prison environment may generate changes in the relationship between staff and inmates. One example from Australia showed a greater reliance on new technologies, such as CCTV cameras, following design change. The surveillance technologies reduced direct supervision and dynamic security in the facilities, making security and control more impersonal, rather than interpersonal. (Grant & Jewkes, 2015: 233-234) Hancock and Jewkes also see a problem in that surveillance technologies have turned inwards towards monitoring staff, signaling reduced trust between managers and employees. (Hancock & Jewkes, 2011: 624)

Stressors

Research on prisoners has long documented stressors of prison life, famously defined as the 'pains of imprisonment'. (Sykes, 1958) It is unclear whether, and to what extent, prison design mitigates stressors and pains associated with prison life. The external stressors that commonly influence prisoners' physical and mental health and social behavior, such as loss of liberty, cancelled family visits, boredom and unpredictability, are not determined by architecture. (Hancock & Jewkes, 2011: 623) Johansen et al. argue that, if prison architecture determines well-being, research on Norway's prisoners ought to report a relatively good quality of prison life, which has not been the case. (Johansen et al., 2011: 526)

Shammas conducted three months of ethnographic fieldwork and semi-structured interviews with 15 inmates in an open prison in Norway. He argues that the design of open prisons in Norway has partly shifted the experiences of being incarcerated, and generated new challenges for inmates, caused by their position between freedom and imprisonment. These challenges include increased confusion, anxiety, ambiguity and boundlessness. (Shammas, 2014: 110-111) This includes having more contact with family members and, thus, being more exposed to family issues, yet, being unable to do anything to help them. When spending time both inside and outside prison, inmates tend to measure their experiences against the level of welfare in their immediate surroundings, not a higher-security prison. This leads to increased feelings of relative deprivation. (Shammas, 2014: 114-115) Open prisons tend to make more use of soft power, such as cognitive-therapeutic interventions, inmate responsabilization and sentencing progression. (Shammas, 2014: 108) Instead of empowerment, open prisons can produce both dependency and frustration. (Shammas, 2014: 113) One example given in the study is an obligatory domestic training course, which by its obligatory nature makes infantilizing assumptions about inmates and projects a vision of inmates as helpless and incompetent. (Shammas, 2014: 118) He further argues that exceptional conditions of confinement can produce an autonomous mindset in inmates, leading to increased risk of rule-breaking behavior and lowered vigilance. (Shammas, 2014: 110) Open prisons still exercise restrictions on inmates on a daily basis, such as curfews, body counts, urine samples, phone restrictions and locked isolation cells. (Shammas, 2014: 107, 117) Moreover, violating institutional rules still produces very 'prison-like' effects. 'When inmates forget their place, officers see it as their job to continuously reinforce the steeply hierarchical relations between inmates and themselves'. (Shammas, 2014: 111) It appears that progressive penal environments cannot exist in isolation, but their operation depends on the existence of 'tougher' prisons where disobedient prisoners can be sent. (Hancock & Jewkes, 2011: 624) In open

prisons, rule breaking leads to a disciplinary report that could affect sentencing progression, including being sent back to a closed prison and postponing release. (Shammas, 2014: 111)

Whose standard of normalization?

A further critique of prisons attempting to provide normalized living conditions is that the definition of normal is inflexible and not determined by the prisoners. The use of modern design furniture may not resemble normality: ‘a modern aesthetic material design does not quell the feeling of a prison-like existence ... Why can’t life behind bars be formed to offer a *real* socio-material “normalization?”’ (Hammerlin, 2018: 262) A qualitative study of a youth facility in Norway found a discrepancy between the architectural design choices and the experience of the youth, resulting in confusion and unease in common spaces that were meant to reflect familiarity. According to Fransson, planned physical settings and practices, such as common meals around a spacious dinner table with strict behavior codes (regarding politeness, participation, etc.) was not familiar to the youth at all, but reflected a Norwegian middle class ideal remote from the backgrounds and own experiences of the inmates. (Fransson, 2018: 186) To others, a homelike environment can be experienced as a painful reminder of the loss of a home and family. ‘It reminds them of the ordinary life outside from which they are secured through isolation, loss of time and deprivation of liberty.’ (Brottveit, 2018: 201) Halden prison was built in rural Norway in 2010. Its rural location made family visits, professional counseling and normalization more difficult, according to one former inmate: ‘So, here I sit in Halden Prison. Beautiful nature! Trees outside my window! A peace and quiet I simply was not used to. I am an Oslo lad, a “townie”, and ... I missed those I loved. This caused me so much internal *noise* that I could not find comfort in those bloody trees outside my window. The silence was more of a torment than a consolation.’ (John K., 2018: 30) The discrepancy in definitions of normalization may increase discontent towards the prison system: ‘The fact that so-called experts have decided that Norwegian nature, trees and silence will be good for me makes me more angry than you can imagine.’ (John K., 2018: 30)

Special needs in prison settings

Prison design and architecture need to take into account special needs in prisons: both individual needs and the needs of prisoners as a group which can be different from the general population. Prisoners may, for example, be more sensitive to noise and insomnia than general populations. Inmates come from backgrounds and life experiences that may make them more sensitive to noise than the general population. (Wener, 2012: 197) Noise sensitivity is enhanced by long-term exposure, involuntarily residence and limited control over the sources of, or amount of exposure to, noise levels. Inmates are exposed to multiple stressors, including stress, frustration and anxiety. (Wener, 2012: 199) One study also found that people with low levels of perceived self-efficacy were more likely to experience stress when exposed to high levels of uncontrollable noise, and that noise had a greater negative impact on people who experienced long-term and chronic unemployment. (Wener, 2012: 197)

Gourdard et al. found that insomnia and its consequences were greater in the French prison population compared to the general French population. The inmate population had more risk

factors associated with insomnia, such as drug addiction or psychiatric disorders, and had problematic living conditions with a lot of inactivity. More than half of the 358 prisoner respondents were dissatisfied with their sleep, which is considerably higher than in the French population (estimated to 15.8% of the general population). Further, 57 percent of those that were dissatisfied stated that their sleeping problems had begun in prison. (Gourdard et al., 2017: 194) The inmates also had more difficulties falling asleep than the rest of the French population, with the prisoners being held awake by ruminative thoughts and anxiety (55 % of inmates) significantly more often than the general insomniacs (25%). Psychological consequences of insomnia were also found to be more frequent in prison which, according to the researchers, may be explained by the higher prevalence of psychiatric illnesses in prison. Psychological consequences may also self-induce sleep problems. (Gourdard et al., 2017: 199) Many inmates have experienced traumas, which may affect their perception of the physical environment in prison. In one qualitative study from a women's prison in Norway, an inmate explained that she had brought heavy traumatic experiences with her when she was incarcerated. Due to the small and static design of the cell, her recent memories of violence were relived. (James, 2018: 171)

Another challenge for prisons is to develop and implement interior design that is supportive of aging inmates. In Sweden, the awareness of these future needs appears to be low (James, 2018: 168). Beijersbergen (2016) found that background characteristics of prisoners were significantly associated with their perceptions of their relationships with officers. Older prisoners, prisoners with a Dutch background, prisoners with no partner, prisoners with a lower educational level and fewer prior imprisonments evaluated their relationships with officers more positively, as did prisoners with a higher score on extraversion and agreeableness. (Beijersbergen, 2016: 861) In Australia, recent prison design models have taken into account diverging needs and ways to normalize the living conditions. A number of prisons have been built to provide environments for particular prisoner groups, including HIV positive and intellectually disabled prisoners, substance-abusers, women and sex offenders. States in Australia have also developed specific Aboriginal prisoner facilities and attempted to locate them near their families. To improve normalized living conditions for Aboriginal prisoners, accommodation units are arranged so that prisoners can be housed according to family ties or language. (Grant & Jewkes, 2015: 238)

4. SUMMARY OF LITERATURE REVIEWS

As a complement to the thematic analysis of literature in the field of prison services and forensic psychiatric care, the researchers also included literature reviews from other institutional settings. Nine literature reviews were found in the searches and included in this study. All reviews were ranked based on their comprehensiveness, transparency and appraisal, and analyzed thematically. Table 3 offers an overview of the reviews, detailing the rank of the evidence presented and the themes identified in each review. The evidence ranking is based on the methodological rigor of the review – in particular the quality assessment of included studies – and the transparency of the research process.

Four literature reviews received the highest evidence grade (+++). These papers have followed established systematic review guidelines and include a detailed methodology section. They include rigorous exclusion and inclusion criteria along with established quality assessment methods in the selection of articles for review, ensuring that only high-quality studies were reviewed. Two of these reviews focus on the effects of physical environment design in a healthcare setting. Dijkstra, Pieterse and Pruyn (2006) restricted their review to include controlled clinical trials focusing on physical environmental stimuli in a healthcare environment. Laursen and Rosenberg (2014) similarly included randomized control trials (RCTs) in their review, as these are understood to provide best evidence according to established review methodology in health care science. (Laursen & Rosenberg, 2014:109) The result of this screening strategy is that fewer studies are included (30 and 14 studies respectively). The third systematic literature review conducted by Ulrich (2017) focuses on rehabilitative environments within special residential homes for young people (*särskilda ungdomshem*). The author conducted a rigorous quality control of inclusion criteria to identify articles that could improve evidence-based policy for the Swedish National Board of Institutional Care (*Statens institutionsstyrelse, SiS*). Although lower quality studies are included, the author clearly acknowledges methodological limitations making it possible to determine the evidence level for each finding. Although the review by Joseph, Choi and Quan (2016) on the effects of environmental design in residential care homes for the elderly included some studies with lower study design quality, the review has been assessed as meeting the highest evidence grade as the authors indicate findings that are presented in these articles and have conducted a quality assessment on the 66 studies reviewed.

Two articles received the medium evidence grade (++). While these articles are described as systematic literature reviews and include comprehensive search strategies, the level of transparency in the quality assessment process is lower, making it difficult for readers to understand the level of evidence in the findings. Gharaveis, Hamilton and Pati's review (2018) lacks transparency and, according to the authors, no established quality assessment tools were used. (Gharaveis, Hamilton & Pati, 2018:122) The authors claim that they rated the quality of the studies included using Pati's ranking, which places meta-analysis at top and consensus opinion of respected authorities at the bottom of the evidence scale (Pati, 2011: 61); however it is not possible to link the sources of specific findings in their analysis. The conclusions state that no randomized studies were included, which lowers the level of evidence according to their own standard. (Gharaveis, Hamilton & Pati, 2018: 132) Connellan et al. (2013) similarly do not

account for which method of quality control was used in selecting articles. Their synthesis is a thematic narrative which does not account for the strength of their findings.

The remaining three studies have not followed a systematic methodology and the findings from these are therefore categorized as being of lower evidence (+). Common to these reviews is the absence of a clear methods section, making it difficult to determine which articles were selected for review and why. Roush (2002) conducted a review of both published and unpublished material, whilst the review by Pressly and Heesacker (2001) includes both research studies as well as theoretical papers. (Pressly & Heesacker, 2001: 158-160) The review by Wener (2006) is somewhat unclear in terms of the screening procedure in selecting articles for review. Wener states that more than 30 research reports exist on the subject of direct supervision facilities – including case studies and cross-sectional and longitudinal comparative studies – although it is not clear if all of these studies are included in the review, and it is difficult to determine the level of quality of the studies referenced.

Table 2. Overview of literature reviews

Study	Evidence value	Themes
Dijkstra, K., Pieterse, M. and Pruyn, A. (2006). Physical environmental stimuli that turn healthcare facilities into healing environments through psychologically mediated effects: systematic review. <i>Journal of Advanced Nursing</i> , 56(2), pp.166-181.	+++	Lighting, Nature, Temperature and smell, Sound, Floor plans
Joseph, A., Choi, Y. and Quan, X. (2016). Impact of the Physical Environment of Residential Health, Care, and Support Facilities (RHCSF) on Staff and Residents: A Systematic Review of the Literature. <i>Environment and Behavior</i> , 48(10), pp.1203-1241.	+++	Size, Nature, Density, Lighting, Floor plans, Interior design
Laursen, J., Danielsen, A., & Rosenberg J. (2014). Effects of environmental design on patient outcome: A systematic review. <i>Health Environments Research & Design Journal</i> , 7(4), pp. 108–119.	+++	Sound, Nature, Lighting, Interior design
Ulrich, R. (2017). Litteraturöversikt -evidensbaserade designrekommendationer för SiS ungdomshem. <i>SiS Vårdmiljö: En Guide För Lokaltveckling 2017</i> , 9, institutional care in focus, 120-161.	+++	Density, Floor plans, Interior design, Nature, Lighting, Sound
Connellan, K., Gaardboe, M., Riggs, D., Due, C., Reinschmidt, A., and Mustillo L. (2013). Stressed spaces: Mental health and architecture. <i>HERD: Health Environments Research & Design Journal</i> , 6(4), pp. 127-168.	++	Lighting, Nature, Temperature and smell, Interior design
Gharaveis, A., Hamilton, D. and Pati, D. (2018). The Impact of Environmental Design on Teamwork and Communication in Healthcare Facilities: A Systematic Literature Review. <i>HERD: Health Environments Research & Design Journal</i> , 11(1), pp.119-137.	++	Floor plans, Lighting
Pressly, P. and Heesacker, M. (2001). The Physical Environment and Counseling: A Review of Theory and Research. <i>Journal of Counseling & Development</i> , 79(2), pp.148-160.	+	Lighting, Interior design, Temperature and smell, Sound
Roush, D. (2002). The Relationship Between Group Size and Outcomes in Juvenile Corrections: A Partial Review of the Literature. <i>Journal for Juvenile Justice and Detention Services</i> , 17(1), pp.1-18.	+	Size, Density

Study	Evidence value	Themes
Wener, R. (2006). Effectiveness of the Direct Supervision System of Correctional Design and Management. <i>Criminal Justice and Behavior</i> , 33(3), pp. 392-410.	+	Floor plans

The findings from the literature reviews are grouped into themes below. In total, 8 themes were identified, some of which include subthemes. The findings under each theme are presented in order of quality, with high quality reviews presented first.

The following 8 themes have been identified:

- Lighting (6 studies)
- Nature (5 studies)
- Floor plans (5 studies)
- Interior design (4 studies)
- Sound (4 studies)
- Density (3 studies)
- Temperature and smell (3 studies)
- Size (2 studies)

Lighting

Lighting was discussed most extensively across all literature reviews. Two high ranked reviews present findings of the effects of lighting on the well-being of hospital patients. Laursen and Rosenberg (+++) found that patients assigned to well-lit rooms reported lower pain levels and less use of pain medication than patients who were assigned to dimly-lit rooms. There was, however, no significant difference in anxiety levels between the two patient groups. (Laursen & Rosenberg, 2014: 115) Support for natural lighting is also found in the review by Dijkstra, Pieterse and Pruyn (+++). Natural light was found to have a positive effect on the length of hospital stay (i.e. fewer days), mortality rates, and perceived stress and pain levels of patients. There were some indications that sunlight is not necessarily beneficial to all patients and that different types of depression should be considered when planning natural light exposure. Persons with bipolar depression improve more with morning daylight, while people with unipolar depression (with no manic episodes) should preferably be placed in a room that lets in sunlight in the evenings. (Dijkstra, Pieterse & Pruyn, 2006: 173) Joseph, Choi and Quan found that ‘improved rest–activity rhythms may result from bright light exposure, especially for residents with dementia’ and that bright light treatment helped in reducing depression. (Joseph, Choi & Quan, 2016: 1222-1223)

The three medium ranked reviews all discussed lighting. Connellan et al. (++) found that lighting affects the mood of patients in mental health facilities. Daylight exposure via nearby windows was in general found to have a positive impact, although strong sunlight could also have a negative effect by causing rooms to overheat. (Connellan et al., 2013:135) Patients exposed to

high-intensity sunlight experienced less stress and pain and had medical costs that were 21 percent lower than patients who were not exposed to sunlight. (Connellan et al., 2013: 133-136) Gharaveis, Hamilton and Pati (++) found that dimly lit spaces led to longer conversations among healthcare staff in comparison to brightly lit spaces as dim lighting 'yields more pleasant and calm feelings'. (Gharaveis, Hamilton & Pati, 2018: 131)

Lastly, Pressly and Heesacker (+) found that participants in a study exhibited a more positive attitude towards a task and experienced less boredom when they were assigned to a room with a window compared to one without. Further support for the use of natural or daylight-simulated lighting was found: daylight-simulated compared to cool-white fluorescent lighting lead to decreased levels of fatigue, while the use of natural light significantly decreased reported incidents of aggressive behavior among elementary school children. Use of light may also help against seasonal affective disorder. (Pressly & Heesacker, 2001: 153-154)

Nature

Four high ranked and one medium ranked review discussed the theme 'nature'. Ulrich (+++) found that physical access, although limited in time, to a garden or other natural environment reduces stress and anger. Physical access appears to be more effective than viewing the environment. The outdoors reduces stress and increases well-being for both staff and inmates. Inaccessible or locked outdoors environments can, however, decrease feelings of control and instead lead to an increase in stress levels. There is emerging evidence that a view of nature or even pictures of nature can reduce stress. (Ulrich, 2017: 115-116) The review by Laursen and Rosenberg (+++) includes one study which assessed the effect of placing plants in surgery inpatients rooms, finding that pain levels and reported medication use were lower among patients who were assigned to rooms containing plants. (Laursen & Rosenberg, 2014: 112)

Both the presence of windows and a view of nature can have a positive effect on clinical outcomes (such as delirium and length of stay), while also improving sleep and time orientation. Joseph, Choi and Quan (+++) found that 'both active and passive engagement with outdoor environments' had a positive impact on elderly, regardless of their physical ability. Elderly patients with dementia were found to benefit from exposure to both outdoor as well as indoor gardens. Benefits were improvements to cognition and sleep patterns, as well as a reduction in agitation levels. The design of the outdoor space was also found to be important in encouraging participation in physical activity among elderly independent residents. An attractive environment encouraged more participation, and the design of paths had a positive effect on participation levels. Well-connected continuous paths without steps and with an attractive view were used more frequently for recreational walking than paths lacking these characteristics. (Joseph, Choi & Quan, 2016: 1219-1220) Falls and fall-related deaths declined amongst dementia residents who frequently used a wander garden. (Joseph, Choi & Quan, 2016: 1227)

Dijkstra, Pieterse and Pruyn (+++) found that patients with access to windows also experienced less sleep- and visual disturbances, and suffered less from hallucinations and delusions. (Dijkstra, Pieterse & Pruyn, 2006: 175) Connellan et al. (++) also conclude that views of nature and gardens can aid in reducing stress and pain.

Floor plans

Floor plans was discussed in two high ranked, two medium ranked and one low ranked review. Ulrich (+++) found that prisons with a physical environment constructed to enable easy overview of the environment facilitate contact and communication between staff and prisoners. Floor plans allowing for direct supervision and frequent personal contact, also makes it easier to carry out risk assessments, and is associated with fewer instances of incident reports, solitary confinements, and rule breaking, while also increasing feelings of perceived safety. (Ulrich, 2017: 117, 145) Direct supervision floor plans avoid long corridors and observation rooms (these make it more difficult to get a good view of the area as well as to interact with clients, as the observer is seated behind glass) in favor of more contact between staff and clients, where clients have their own rooms spaced out around larger communal areas, or alternatively, several short corridors radiating from a central communal space. (Ulrich, 2017: 117, 148)

Dijkstra, Pieterse and Pruyn (+++) found that spatial layout impact on patients' perceptions of privacy. Emergency department patients who stayed in curtained cubicles experienced less privacy than patients staying in rooms, as they believed that others could hear and see them through the curtains. (Dijkstra, Pieterse & Pruyn, 2006: 175-176)

Gharaveis, Hamilton and Pati (++) found that factors such as layout of work stations, corridor design, and size of the spaces influenced communication patterns between staff and staff-patients. Spatial arrangements like walls and partitions can either decrease or increase communication. (Gharaveis, Hamilton & Pati, 2018:130) The layout of a space is often designed by architects and seldom takes the practitioners' point of view into account, which inhibits effective team work and interactions between staff and patients. (Gharaveis, Hamilton & Pati, 2018:125,129) Connellan et al. (++) found that layout impact on sound. Specifically, long corridors should be avoided as they are a source of loud noises and echoing sounds. (Connellan et al., 2013:149)

Wener (+) found that introducing a direct supervision model of correctional management and design (DS) led to a reduction in assaults and other forms of violence. Incidents of vandalism, including graffiti and destruction of mattresses and TVs, were much lower in DS facilities (Wener, 2006: 396). Facilities following this model were also viewed as being safer by both staff and inmates, although one study found no significant correlation between 'design and supervision style' and the number of infractions. (Wener, 2006: 393-394) DS facilities required less staff, had lower levels of staff turnaround and sick-leave, lower repair costs (from less vandalism), and used cheaper building materials. Findings on the quality of the work environment for staff are generally positive but mixed. According to Wener, 'It is possible that early reports in some ways overstated the benefits of DS because of the stark comparisons that were made with jails that were old, in poor repair, and had insufficient space.' The implementation of DS into facilities was also accompanied by significant staff training, making it difficult to detangle which effects were due to the physical environment and which were due to changes in staff behavior. Notably, DS facilities experienced significantly more crowding than non-DS facilities, which could mean that some of the negative outcomes found in the reviews could be due to overcrowding rather than a shortcoming with the DS model itself. (Wener, 2006: 405-406)

Interior design

The theme interior design was discussed in two high ranked, one medium ranked and one low ranked review, and includes discussions on color, artwork, furniture, and texture. The review by Dijkstra, Pieterse, and Pruyn (+++) included 11 studies which focused on the effects of renovation and redecoration interventions in hospitals on the well-being of patients. These included re-painting walls and doors (typically from dark to bright colors), replacing old furniture, and normalizing the décor in wards and waiting rooms to give them a more homely feel. Mainly positive effects were found in remodeled wards and rooms, although some studies also reported negative effects, such as lower self-maintenance skills. (Dijkstra, Pieterse & Pruyn, 2006: 169) Ulrich (+++) concludes that furniture placement can have an effect on the environment in youth homes. Large stationary seating areas can, for example, foster feelings of territoriality and lead to more dominant youths claiming control over the space to assert their control. Movable furniture enhances perceptions of control and can – along with normalized interior design – reduce the damage made to furniture, vandalism, and other general acts of aggression. Ulrich therefore questions design choices made on the assumption that moveable furniture should be avoided as they may constitute a security risk. (Ulrich, 2017: 133-134)

Connellan et al. (++) found that research on color choices for walls in mental health care facilities yielded inconsistent results, although one study on psychiatric hospital design found that blue tones could be calming whilst bland colors and so-called “trendy palettes”² should be avoided. Pressly and Heesacker’s (+) found some support for the fact that color can impact mood and task productivity, although the findings are rather vague as there are few studies or sources referenced. For example, that the color blue is associated with increased calmness. Blue is also the preferred color for young adults, followed by green and red. Another study found that all age groups associate positive emotions with bright colors and negative emotions with dark colors. (Pressly & Heesacker, 2001:151)

Visual art can have a positive impact on mood, as found by both Connellan et al. and Pressly and Heesacker. Natural images were viewed particularly favorably by hospital patients, whilst more abstract and stylized art should be avoided. (Connellan et al., 2013: 145,157) Similarly, Pressly and Heesacker (+) conclude that patients consistently preferred texturally complex paintings of natural settings over simple poster images. This was found regardless of patient characteristics (such as age and length of stay). Abstract paintings were particularly unpopular, with patients expressing that they did not wish to look at art that was difficult to understand. Fixed artwork led to higher levels of stress among patients, as they were unable to choose or move it themselves. (Pressly & Heesacker, 2001: 150) Clients prefer desks and more closed off spaces in a counselling environment, whereas counsellors prefer a more open environment. The presence of a desk was viewed favorably by clients with low anxiety, whilst clients with a high level of anxiety responded negatively to the presence of a desk. (Pressly & Heesacker, 2001:151-153) The texture of the furniture and other interior design elements such as carpets can influence a person’s perception of a room. Soft textures, for example, is associated with a soft, welcoming environment.

² It is unclear which colors are included in trendy palettes. The authors of the literature review from which this finding is taken have not defined it either.

Textures can also have an impact on sound quality and lighting. (Pressly & Heesacker, 2001: 155-156)

Sound

Sound was discussed in one high ranked, two medium ranked and one low ranked review. A total of 12 studies included in the review by Laursen and Rosenberg (+++) assessed the effects of different audio interventions on the well-being of surgery inpatients.³ They found that music decreases anxiety and pain intensity among surgery patients. (Laursen & Rosenberg, 2014: 114-116) Dijkstra, Pieterse and Pruyn (+++) also reviewed studies that assessed the impact of music on patient well-being. One trial found that 91 percent of patients who were played music during their coronary surgery perceived the sound environment as pleasant, compared to 56 percent who did not listen to music. One trial found that patient characteristics influenced whether the music played had a positive or negative impact on a patient's perception of the environment. (Dijkstra, Pieterse & Pruyn, 2006:175) As well as studies on music, the authors included studies on general sound quality, finding that patients admitted to an intensive care unit (ICU) with bad acoustics had significantly higher re-hospitalization rates than patients admitted to an ICU with good acoustics. Furthermore, the perception of care quality was found to be positively affected by good acoustics. Connellan et al. (++) found that excessive noise is a stressor leading to increased heart rate and blood pressure. (2013:139) Similarly, Pressly and Heesacker (+) found that loud and sudden sounds have a negative effect on people, although a complete absence of sound may also be detrimental. Sound may hinder tasks that require hearing and internal monologue but aid in tasks that do not require hearing. Sounds associated with a particular meaning (such as a baby crying) may be particularly distracting in task performance. Sounds that are perceived as pleasant (like music) can help in task performance, and can be used to mask negative sounds. (Pressly & Heesacker, 2001: 155)

Density

Density was discussed in two high ranked and one low ranked review. Ulrich (+++) found that low social density alleviates stress and, by extension, aggressive behavior. Social density (the number of people per room) is a more important factor than spatial density (the size of the room) in causing stress. Higher density levels can be expected to increase stress levels significantly, and can therefore increase the risk of aggressive behavior caused by stress. Social density is more important than the overall number of residents in a facility or unit. (Ulrich, 2017: 114-115) When at full capacity, a unit should keep to a social density level of less than 0, 5 persons per room.⁴ There is strong support for the fact that private rooms with private bathrooms reduce stress within prison environments, whereas shared rooms or bathrooms

³ Two studies played 'natural sounds' to participants (in one study the natural sounds are described as being 'soft winds and twitter'), while 10 studies used some form of calming or soothing music. In two studies, the patients were allowed to select the music they listened to themselves. In all studies, patients listened to audio via headphones.

⁴ Included in the definition of room are both private and shared bedrooms, private and shared toilets and bathrooms, common spaces, as well as any garden or outside space where staff presence is not required. Corridors are not included. Ulrich, 2017: 136-137

increase aggressive behavior. Small residential groups have also been found to reduce stress in youth homes. (Ulrich, 2017: 130-131) Lastly, inmates and people with a history of aggressive behavior need significantly more personal space than others and the experience of crowding and perceived violations of personal space are amplified in small spaces. (Ulrich, 2017:133) In contrast, the literature review by Joseph, Choi and Quan (2016) (+++), which looked at the effects of the physical environment in 'Residential health, care and support facilities' for the elderly, found no correlation between higher density levels and negative effects on the well-being of residents. (Joseph, Choi & Quan, 2016: 1222, 1228) It is possible that prisons are more crowded than elderly homes, which would explain the different findings.

The reviews by Connellan et al. (++) and Roush (+) also contrary found that high social density had negative effects on patients. One literature review discussed by Connellan et al. found several studies reporting that crowding increases assaults and other security risks within mental health facilities. (Connellan et al., 2013:132) Roush concludes that social and spatial density may reduce the negative effects of crowding. One study compared the effects of social density and spatial density on dorms of different sizes, finding that an increase in social density mattered less in the larger dorm than in the smaller dorm (the larger dorm was about twice the size of the small dorm). (Roush, 2002: 12-13)

Temperature and smell

No high ranked reviews discuss temperature or smell. Two medium and one low ranked review discussed the topic. Positive smells and aromas can have a relaxing effect on muscles, and can improve concentration and enhance production of endorphins. Unpleasant smells may, on the other hand, be associated with anxiety, stress and fear. (Connellan et al., 2013:139, 143-144) (++) Dijkstra, Pieterse and Pruyn (++) found that the use of scented oil in the waiting room of a dental practice led to a decrease in anxiety, as well as an increase in calmness and improvements in mood, although this latter finding was only significant for women. (Dijkstra, Pieterse & Pruyn, 2006: 175) Pressly and Heesacker (+) found that smell can affect people's mood, memory and behavior. Unpleasant smells have, for example, been found to trigger retrieval of unpleasant memories, whilst pleasant smells trigger the retrieval of pleasant memories. Men may behave more aggressively following exposure to unpleasant smell. (Pressly & Heesacker, 2001: 154)

Pressly & Heesacker also mention indoor temperature. Individuals are typically most comfortable in temperatures ranging from around 21°C to 27°C. Research on the effect of indoor climate on individuals suggests that motionless air and an unchanging environment may have a negative impact on individuals as it could lead to a decrease in vitality. (Pressly & Heesacker, 2001: 156)

Size

The theme 'size' covers group size, unit size, and facility size and is closely linked to the theme of density discussed above. One high ranked and one low ranked review explored this theme. Joseph, Choi and Quan (+++) found that smaller residential units were more beneficial for frail, long-term senior care residents. (Joseph, Choi & Quan, 2016: 1220) Smaller units were also found to have a positive effect on staff, with one study finding that nursing staff at small facilities

reported higher degrees of satisfaction and motivation than staff at larger facilities. Staff at larger residential-home units experienced more time pressure. Resident quality of life was also reported to be lower at these larger facilities. Staff working in specialized dementia units reported significantly higher satisfaction than staff working in non-specialized units. (Joseph, Choi & Quan, 2016: 1230)

Similarly, Roush (+) found that smaller group sizes have positive effects on youth in detention centers. Smaller group sizes foster more intimate relationships, both between staff and inmates and among inmates. Male juvenile offenders placed in smaller living units ‘showed greater affection toward and identification with counselors.’ (Roush, 2002: 6) Inmates housed in a smaller unit (38 beds instead of 47 beds) had fewer time additions to their sentences than inmates housed in the larger unit. As a result, more spaces were kept open as juveniles left the center rather than staying for a longer period of time. (Roush, 2002: 8) Smaller units are associated with more effective programs, as fewer residents allows for more focus on each individual participant. One-on-one instruction has been found to be more effective than group instruction in several studies conducted with school children as well as with juvenile offenders. (Roush, 2002: 5-6, 10-12) Large groups are typically accompanied by a lower staff-youth ratio, explained by the fact that staff size is not increased along with residence size due to the costs. (Roush, 2002: 11) As a result, the focus tends to turn towards controlling inmates rather than preparing them for life on the outside. (Roush, 2002: 5-7) Once groups reach about 20 juveniles, subgroups start to form, within which hierarchies develop; 15-20 people was identified as an appropriate group living size for juvenile offenders. (Roush, 2002: 6) According to Roush, the overall size of the institution also plays a role, but not as big of a role as group or unit size. Roush found that the existing literature has conflicting findings with regards to whether prison size has an impact on inmates’ behavior, but there was some evidence that the overall effectiveness decreases with increases in institutional size. (Roush, 2002: 9)

5. DISCUSSION

This literature review has summarized recent articles and book chapters on how the physical environment matter for prison services in a narrative synthesis. The aim was to provide a basis for future discussions in the Swedish Prison and Probation Service on supportive environments (*Stödjande miljö*). As described in the methods section of this paper, and highlighted in many of the articles reviewed, the nature of existing research is such that it is not possible to determine the impact or effect of specific interventions on prison or remand center populations. Research on how architecture and design influence well-being and recidivism among prisoners is very limited, with few empirical studies. Relevant empirical studies have been conducted in different contexts and on small, or otherwise specific, groups. The findings should therefore be approached cautiously, and not be assumed to be directly replicable outside of their contexts.

Despite diverse methodologies and contexts, common themes could be constructed by the authors. The theme with the strongest findings based on existing research was the benefit of normalized living conditions for well-being of prisoners and forensic psychiatric care patients. Three relevant studies with strong study design were found and included in the review. Tartaro et al. (2008) observational cross-sectional study found that those US prisons with a less institutional and more comfortable living environment, where inmates could control lighting and walk in and out of their rooms when they wanted, were less likely to report at least one inmate suicide. Valeer et al.'s (2005) post-test quasi-experimental study of the refurbishment of Østmarka hospital's acute psychiatric ward in Norway, found that vandalism was significantly reduced in the homely wing of the hospital over a two year period, compared to the traditional wing. Long et al.'s (2011) small pre-post evaluation study of a redecoration of a ward environment in a female medium security unit in the UK found that a normalized interior design was associated with higher patient satisfaction, a reduction in overall symptomology, anxiety and guilt, and no change in misbehavior. In these studies, many changes in the physical environment occurred at the same time. Therefore it is not possible to determine a specific or isolated intervention that was most effective.

Two studies by Bierie looked at the physical environment broadly. His regression analysis based on an annual survey of prison staff in the USA (2012) found that violence declined significantly as the quality of physical conditions improved (noise, dilapidation, privacy, etc.). Inmate violence was significantly lower in prisons with better physical environment. The results held independent of staff characteristics and other structural factors (e.g., staff–inmate ratio, crowding, and security level). He also used the data to measure the effect of intrusive noise, clutter and dilapidation in prisons on staff well-being. He found that harsher conditions were associated with reduced well-being, including increase in sick leave use, alcohol and tobacco use, somatic symptomology, psychological symptomology and personal worries. The prison architecture literature expands the concept of normalization. While controlled studies are lacking, observational studies in prisons found that it appears important that prisoners feel that they have some influence over their immediate surroundings: opening a window, adjusting the blinds, hanging personal art or photographs in their room, being able to step outside without personnel, play music they enjoy, etc. When prisoners are hindered from making such small decisions, it enforces the feeling of

institutionalization and encourages prisoners to enact their agency in other ways: by, for example, playing loud music or hang clothes in the windows to block out strong sun light. Dogbeh et al.'s study measured indoor temperatures and CO₂ concentration levels in a Danish remand prison, and found not only that both failed to meet the national standards, but also observed that inmates who had a chance to open a window had significant better indoor climate. Without blinds or curtains, '[m]any inmates, especially those occupying cells oriented towards southeast and southwest ... used towels, cloths and bed sheets as internal shading.' (Dogbeh, 2015: 24) Shammas (2014) three months long ethnographic fieldwork and semi-structured interviews with 15 inmates in an open prison in Norway, found that the progressive prisons are associated with specific pains of imprisonment, including dependency and frustration. He found that the physical design of open prisons stands in contrast to the traditional penal restrictions placed on inmates on a daily basis, and the consequences of breaking rules. Johnsen's observation (2018) of the organization of leisure activities in a Norwegian prison found a discrepancy between the sought outcome of normalization in the interior design, and the institutionalized activities highly restricted in movement. She suggests that the concept of normalized living environment in prisons ought to go beyond homely interior design to include daily routines.

Several of the non-empirical studies return to the assumption of prison life and the deprivation of liberty as being inherently subversive. The role of prison architecture is primarily to mitigate the negative impact of prison life on the inmate and, secondly, to allow for necessary functions and constructive activities to be carried out within the institution. (Hammerlin, 2018, Hancock & Jewkes, 2011) A substantial shift in program activities may be more easily realized if supported by a shift in the physical environment. In their evaluation of a new prison program in Wales, Clancy and Maguire (2017) found that the purposely built 'Family Interventions Lounge', contributed to a successful implementation of a family intervention program at the facility. The project evaluation's positive findings were reflecting on the full program, not the custom-made space hosting its participants. This approach to understanding prison design and architecture primarily sees the physical environment as a structure to be filled with relevant content. However, new needs may arise when developing prison programs that require adjustments in the physical environment.

The findings from the literature reviews support the idea that the physical environment affects mood, task productivity, and perception in different ways. Eight recurring themes were identified across the literature reviews, for which there were varying degrees of evidence. The theme which held the strongest empirical support was nature followed by lighting, floor plans, interior design, density, sound, size, and temperature and smell. While several of these themes also emerged in the prison architecture literature, few empirical studies had been carried out on prison populations. The literature reviews, which had a broader focus, therefore helped in substantiate the themes raised in the prison articles and book chapters. All reviews which discussed nature found that access or the ability to view nature was beneficial. Access to a garden or other natural environment can reduce stress and anger levels, although inaccessible garden areas cause added stress. There is support for the use of natural lighting over artificial, yet, strong sunlight could be negative and light therapy showed inconsistent results. Dimmer lighting is, however, preferred in certain situations as it encourages communication and creates a more relaxing atmosphere. When considered together, the subthemes included under interior design (color, artwork, furniture and

texture) suggest that creating a more homely environment is beneficial, and institutionalized design choices such as fixed artwork or furniture, which have been used out of security concerns, are perceived negatively. Findings on the subtheme color were mainly inconsistent, with one exception: bright colors are perceived more positively than dark colors. Lastly, ambient conditions were also found to have an effect on mood. Soothing sounds such as calm music or nature sounds can, for example, be used to alleviate stress. Smells can impact mood, memory and behavior and may therefore have either negative or positive effects on individuals. Unchanging indoor climates may reduce vitality, and individuals typically prefer environments which fall within a temperature range of 21 °C to 27°C.

While needs to improve indoor climate and reduce noise can be considered universal, several studies have emphasized that the prison population likely have enhanced needs compared to a general population. Prison populations are constantly exposed to their environment and sometimes for a very long time. Furthermore, prison populations may be more vulnerable to crowding, invasions in their personal space, noise or insomnia than a general population. They are more likely to experience problems with substance abuse, tobacco consumption, concentration, past traumas and aggressive tendencies than a general population. It is worth pointing out that prisoners are a heterogeneous group and are unlikely to respond to static physical environments in the same manner. There are likely to be geographical differences in the needs at specific facilities. Understanding the effects of different kind of lightning, may, for example, be especially important in Scandinavia, where in winter time day light is significantly reduced and the bright summer nights may disrupt sleep. Furthermore, our facilities may be better suited to isolate heat, and may therefore be poorly designed to deal with occasional heat waves in summer. While the extensive existing research of the physical institutional environment provide a sound basis, the needs and characteristics of prison populations and prison life need to be assessed and monitored to make appropriate design choices with regards to prisons and remand prisons in the future.

Despite the lack of empiric studies examining the influence of the physical environments on prison populations, it is worth noting the recent growth in prison architecture research. Scholars in various disciplines are taking an interest in the issue with criminology and human geography leading the developments. Three international academic conferences on the emerging field of ‘Carceral Geography’ were held in the United Kingdom between 2016 and 2018.⁵ Presenters included established scholars as well as PhD students, indicating that prison architecture has captured the interest also of the next generation of academics. In less than a decade, several books have been published on prison architecture and design, providing reviews of the existing literature as well as defining, re-conceptualizing and problematizing the area of research and practices— evolving towards a notion of rehabilitation. (Giofrè, 2018: 102) These include Moran and Schliehe (2017) *Carceral Spatiality: Dialogues between Geography and Criminology*; Fransson, Giofrè and Johnsen (2018) *Prison architecture and humans*; and Wener (2012) *The environmental psychology of prisons and jails: creating humane spaces in secure settings*. The trend is influenced by critical theories, new concepts and approaches and qualitative methodologies. Compared to research published in the 1970s and 1980s, there is a clear shift from quantitative studies based on functionalistic approaches (with regards to e.g. layout of facilities) and with a dominant focus on the United

⁵ <https://carceralgeography.com/conferences/conference-2016/>

States. Instead, we now see studies using ethnographic methodologies, such as participatory observations, in prison settings in, for example, Norway and the UK.

Recommendations

There is support in the scientific literature for a holistic approach to architecture and design and to embed design decisions in an overall framework involving program activities and staff behavior. The report *Stödjande miljöer för klienter i Kriminalvården* shows that SPPS has a good understanding of how the physical space is perceived by inmates and what features are desirable. In particular, the report mentions spaces that allow for natural interaction between staff and clients, windows with views of nature to enhance well-being, the preference of homely environments, the need to break monotony and reduce the psychological harm of isolation. (Kriminalvården, 2017: 37-39) While the intention and understanding are in line with international research, it is unclear from the report to what extent this is implemented in facilities. On the contrary, the environmental conditions in Swedish remand prisons appear far from meeting the vision presented.

The embeddedness of physical space into overall policy requires constantly emphasizing the enabling qualities of architecture and design. While the physical space will always be subordinate to the content that fills this space, it is worth underlining the value of architecture and design in enabling good relations, program activities and rehabilitation. Expansion and refurbishment of facilities are events that invite new ideas and investments to improve rehabilitative architecture and design. However, changes in the programming also provide momentum to new content or approaches by adjusting the physical space.

Facilities that enable and encourage face-to-face interactions between staff and prisoners are strongly preferred in a number of studies. Similarly, private ensuite rooms are preferable. This is more easily achieved in smaller units. While Swedish facilities are considered small by international comparison, there are reasons to maintain modest sized facilities and units in expansion planning.

Sweden is at the forefront internationally in terms of developing the concept of supportive prison environments. Yet, none of the studies reviewed in this report were based on research conducted in Sweden. The expansion of Swedish remand and prison facilities provide a good opportunity to operationalize the lessons learned from research and to conduct a number of studies, including evaluating changes in well-being, social relations, or program efficiency, before and after the interventions.

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Annex 1. Search terms and results

Term	AND	OR	AND	NOT	No. of results
Architectural design	jail	incarceration or prison			3
Art	Prison			education	139
Audio environment	prison, jail				2
carpeting	prison, jail				0
Environmental stimuli	prison, jail				0
Forensic psychiatry	interior				1
Impact of architecture on health outcomes	jail	incarceration or prison			2
Long-term care facility	rehabilitation		prison jail		4
Mental health care	prison		design		5
nature	prison, jail		rehabilitation		16
Noise	rehabilitation or therapy or treatment	music	prison		7
odour	prison				0
Physical environment	jail				7
plants	Prison				27
Post-occupancy evaluation	Interior design				1
'prison design & construction'	rehabilitation				1
Residential health	Prison				550
room	rehabilitation in prison				5
Settings of care	environment		prison		34
Spatial layout	prison	jail or incarceration or imprisonment or correction facilities			1
Therapeutic environment	prison	jail or incarceration or imprisonment or correction facilities			3
View	prison	jail or incarceration or imprisonment or correction facilities			455
Visual environment	prison	jail or incarceration or imprisonment or correction facilities			6
Windows	prison	jail or incarceration or imprisonment or correction facilities			33



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