Design With People in Mind The Sound Issue

No 2 in a series of booklets, published by the Design in Mental Health Network, 2018


Welcome to the **Research and Education** Workstream of the **Design in Mental** Health Network. We are committed to the development of an evidence based resource, to inform decision making and improve experiences within mental health services

Introduc Sound I Sound C Sound a Sound o Sound a Sound a Sound I Sound E Sound E Referen Further



Contents

ction	4
mpact	6
Control	8
and Sleep	10
of Nature	12
and Music	14
and Space	16
nterpretation	18
Experience	20
Design	
Sound scapes	22
Soundbites from Madlove	24
ces	26
Information	28

Design with sound in mind

This publication is the second in the Design with People in Mind book series, and we are delighted this year to present on the topic of sound. By popular demand, we were asked to consider the impact of sound on the overall atmosphere and management of a mental health care environment. Acoustic design can dramatically affect the way we feel about ourselves and other people, reduce or increase stress levels and even alter our behaviour and physiology. Sounds can make us feel either attuned to our environment, or disconnected and even fearful of it. They can help us relax, or make us feel anxious, frustrated or stressed, which in turn can lead to isolation and even impact our recovery.

In this publication, we have gone beyond describing acoustic design as something separate from the individuals who occupy environments. With this in mind, we have examined a range of issues specific to mental health, including sleep, privacy, confidentiality, aggression, stress and ultimately recovery. It is striking that sleep deprivation is known to exacerbate a person's distress, and yet the majority of individuals using inpatient services experience poor quality or a lack of sleep, due in part to noisy care environments. It is also well established that aggression, impulsivity and risk behaviours can increase when people feel out of control, or more stressed; we have found that echoes, reverberation and high noise levels can intensify these feelings and behaviours.

More positively, we have found that much can be done to encourage relaxation, increase positive mood and promote a greater sense of connection with others, through natural sounds. Research indicates that the ambience and atmosphere of a unit can be transformed by small acoustic adjustments that improve not only relations between staff and patients, but serve as non-pharmaceutical and even therapeutic interventions. We are interested in linking such evidence to examine how sounds make people feel, how they act and move in the environments that are designed to help them heal. We invite you to think of how to build positive sound measures into the design of mental health care environments, as we believe this benefits all.

During our investigation of the evidence, we have found considerations of sound in mental health to be limited, and so have identified a range of vital issues relevant to general health care, as well as mental health care environments. This book is a snap shot of our review of the evidence, and we hope an approachable way to reflect upon sound as a key sensory mode through which design decisions can be more sensitively implemented.

And finally, we have thought it would be helpful to identify key questions, areas and debates, to orient the reader more effectively and to provide a space for reflection. In doing so, we have explored all relevant disciplines; psychology, architecture, geography, nursing, design sociology, serviceuser literature and psychiatry, to provide a useful summary of the kind of research that should be considered when designing for mental health care environments.

Our vision is for evidence to be put to good use, in the hope it will benefit those who live and work in mental health environments, and beyond.

Professor Paula Reavey Katharine Harding







Sound impact

Research shows that hospital noise levels have been increasing consistently since the 1960s, with sound pressure levels typically exceeding recommended guidance (Busch-Vishniac et al., 2005). Accordingly, studies have examined the impact of sound and acoustics within healthcare environments and findings suggest that excessive noise can affect both physiological and psychological health (Ulrich, Zimring, Quan, & Joseph, 2006).

Although there is limited research examining the acoustic environment and the effects of noise in mental healthcare settings, sound levels recorded in psychiatric hospital wards have been shown to match or exceed those recorded in community or workplace environments in which noise levels have affected cognitive or cardiovascular functioning (Holmberg & Coon, 1999).

Reviews of research studies examining the impact of sound in general hospitals suggest that noise levels might have significant health consequences for service users, including raised blood pressure levels and sleep disruption, alongside increased length of stay and likelihood of re-admission (Hsu, Ryherd, Waye, & Ackerman, 2012; Joseph & Ulrich, 2007).

Akansel and Kaymakçi (2008) measured sound levels in a coronary intensive care unit and undertook a questionnaire survey to examine service users' perceptions of noise disturbance. Findings showed that the sounds of other service users, equipment alarms and staff conversations were amongst those considered to be most disturbing, whilst perceptions of disturbance did not arise from noise relating to treatment and care activities or oxygen supplies and respiration equipment.

Although the hospital was generally perceived to be noisy, 91.4% of patients also reported that the presence of staff and technological equipment contributed to perceptions of safety in the environment.

Whilst research examining the impact of noise on hospital staff is limited, a literature review by Ryherd, Okcu, Ackerman, Zimring and Waye (2012) indicates that the effects of noise on staff are generally negative. The review findings suggest that noise may have important implications for staff health and levels of stress, in addition to job performance, satisfaction and perceptions of the psychosocial environment.

Although the findings indicated high overall levels of satisfaction with services, particularly regarding the availability of qualified psychiatric staff, a reported area of dissatisfaction related to environmental issues, including unhelpful levels of noise in the busy environment and perceptions of a lack of privacy within the triage area.

Crowley (2000) similarly highlights the significance of environmental ambience and acoustic conditions in research examining the quality of care provision for people experiencing mental distress attending an accident and emergency department. The findings of a value clarification survey indicated that attributes including privacy, quietness and calmness were considered by nursing staff to be fundamental to positive mental healthcare in an A&E setting, however, it was noted that opposite qualities were afforded by the environment which was open, noisy and busy.

Sound Impact

The review of studies investigating hospital sound undertaken by Joseph and Ulrich (2007) highlights how acoustic conditions can impact on effective communication, such that noise may influence the intelligibility of speech or signals, which in turn could affect safety or quality of care. The findings also suggest that the quality of the acoustic environment is significant to the affordance of privacy and that poor acoustic conditions which allow the spread of sound between areas might lead to breaches in confidentiality.

Concerns relating to privacy and the acoustic environment were reported by participants in a study by Summers and Happell (2003) examining service users' perceptions of services provided in the psychiatric department of a tertiary hospital emergency department.

Further research is required to examine the impact of noise and the acoustic environment in mental healthcare settings, however, notwithstanding some inconclusive results, the findings of research indicate that the effects of noise and poor acoustic quality on service users and staff are typically negative (Hsu et al., 2012; Ryherd et al., 2012).

Sound control

The high noise levels commonly found in healthcare environments result from both the presence of multiple mechanical or human sound sources and from typical physical features including smooth, sound-reflective surfaces which can cause sounds to echo, overlap with other sounds or produce long reverberation times (Joseph & Ulrich, 2007).

A review of research examining the effects of hospital sound on service users, staff and visitors undertaken by Joseph and Ulrich (2007) draws attention to the importance of sound control to promote positive health outcomes and improve perceptions of privacy, or clarity of speech and sounds. The review findings suggest that hospital noise levels can be effectively reduced through a combination of environmental strategies, including the reduction or removal of loud sound sources, integration of sound-absorbing finishes and provision of single bedrooms.

Studies exploring the use of physical interventions to reduce hospital noise include a pilot study by Farrehi, Nallamothu and Navvab (2016) examining the impact of installing acoustic panels to the walls and ceiling of a corridor adjacent to bedrooms in a general hospital ward. Acoustic measurements indicated a significant difference between the ambient sound levels of the corridor when compared with a control corridor without the acoustic intervention. The acoustic panels primarily impacted on the diffusion of mid-frequency sound levels, resulting in a reduction of approximately 3-4 dBA. Although the installation of four panels achieved a modest sound level reduction, the findings offer support for the use of acoustic panels to improve acoustics in healthcare environments.

Ryherd, West, Busch-Vishniac and Persson Waye (2008) highlight that variations in physical conditions, equipment and occupational activity within different ward types result in unique soundscapes and present findings from crossdisciplinary studies investigating hospital noise and sound control undertaken in a variety of clinical settings. The results of installing sound-absorbing panels in a haematological cancer unit reported in one study included a reduction in reverberation time and sound levels, such that whilst 92% of nurses surveyed perceived having hearing problems during ward rounds before the intervention, only 8% reported hearing problems afterwards (MacLeod, Dunn, Busch-Vishniac, West, & Reedy, 2007). Almost 30% of patients surveyed perceived that noise disrupted daytime rest before the intervention, compared with 0% afterwards.

The impact of acoustic quality on staff well-being at work was examined by Blomkvist, Eriksen, Theorell, Ulrich and Rasmanis (2005) through a study in which either soundreflecting or sound-absorbing ceiling tiles were installed in a critical coronary care environment. A positive acoustic effect was generated by the use of sound-absorbing tiles and resulted in reduced reverberation times and increased speech clarity. The study findings suggest that noise reduction can mediate the risk of clinical errors or conflict and staff also reported a reduction in perceived strain and pressure when working in the improved acoustic environment.

Another study undertaken within this coronary care setting by Hagerman et al. (2005) examined how patient outcomes might be affected by receiving care under either positive or poor acoustic conditions created by different ceiling tile types. Measures of patient cardiovascular functioning indicated an association between acoustics and pulse amplitude at night for myocardial infarction patients, whereby higher patient pulse amplitude was found in the poor acoustic conditions. At a 3-month follow-up, the incidence of re-hospitalisation was significantly higher amongst patients who had received care in the poor acoustic condition. Greater satisfaction with staff attitude was also reported by patients receiving care within the positive acoustic environment.

Whilst research examining sound control in mental healthcare settings is limited, Brown et al. (2016) found that simple interventions, including applying felt pads to furniture on an older adult mental health ward achieved reduced sound levels. Noise reduction was in turn perceived by staff as contributing to the overall effect of a group of measures in reducing incidences of physical aggression on the ward. Avoiding the creation of highly reverberant spaces, which may exacerbate the perceptual distortion experienced by some service users during distress, is particularly significant within mental healthcare environments where large, open day areas are typically connected to long echoic corridors (Karlin & Zeiss, 2006).

Sound Control



Additional research to examine sound control in mental healthcare is required, however, existing studies suggest that improvements to acoustic quality within general healthcare settings may have important implications for service user health, rehabilitation and quality of care, in addition to staff performance and well-being at work (Joseph & Ulrich, 2007).

63% of newly admitted service

users perceived having a sleep problem

(de Niet et al., 2010)

Sound and sleep

Sleep is fundamental to maintaining good physical and psychological health and the impact of sleep disturbance and poor sleep quality is especially significant within mental healthcare settings in which people experiencing distress may have an increased need for sleep (Southwell & Wistow, 1995).

Mental distress is commonly associated with sleep disturbance (Abad & Guilleminault, 2005) and a study examining the perceived sleep quality of 150 inpatients on several different wards within a university hospital, found that the 50 participating patients on the psychiatric ward experienced significantly worse sleep quality than patients on other wards (Do an, Ertekin, & Do an, 2005).

Suggested reasons for this difference include the experience of anxiety evoked by an unfamiliar environment and a negative impact on sleep quality resulting directly from the experience of distress.

Kamphuis, Karsten, de Weerd and Lancel (2013) studied the prevalence of sleep disturbance amongst mental health service users in a forensic inpatient setting and found that almost 30% of participants experienced one or more disorder relating to sleep, especially insomnia, with 49.1% reporting poor sleep guality. Further research with service users in two forensic inpatient facilities studied the relationship between aggression and sleep and the results indicated a correlation between sleep difficulties and higher levels of self-rated aggression or impulsivity, together with higher levels of hostility, as rated by clinicians (Kamphuis, Dijk, Spreen, & Lancel, 2014).

Studies to examine non-pharmacological interventions aimed at improving sleep quality in mental healthcare environments include a pilot study within three psychiatric admission wards by de Niet, Tiemens and Hutschemaekers (2010) in which they found that 62.8% of newly admitted service users perceived having a sleep problem. Two brief evidence-based interventions to promote sleep were introduced during the study and facilitated by nursing staff.

Berg (2001) examined the acoustic quality of healthcare environments in relation to sleep and conducted an experimental study to explore the effect of sound stimuli on the sleep of 12 healthy participants in a former surgical ward environment. Whilst sleeping under conditions in which either sound-reflecting plaster ceiling tiles or sound-absorbing ceiling tiles were installed in the space, participants were exposed to a series of sound stimuli, which included traffic noise and closing doors. Somnographic measurements of participants' arousal responses indicated a significantly lower mean value of arousal response to the same sound stimuli in the condition with the sound-absorbing tiles than with the non-absorbing tiles. The study findings therefore suggest that the reduced reverberation time created by sound-absorbing ceiling tiles may reduce sound-induced sleep fragmentation through improving the sound quality of the acoustic environment.

A stimulus control intervention on one ward comprised a form of cognitive behavioural therapy designed to re-establish an association with the bed as a sleeping environment. In a music-assisted relaxation intervention introduced to a second ward, service users listened to a choice of soothing music on an MP3 player at bedtime. The third ward served as a comparison and service users received regular care without any additional interventions. Whilst there was no significant improvement in sleep quality following the stimulus control intervention, the study findings indicated a statistically significant improvement in perceived sleep quality produced by the music-assisted relaxation intervention.

A report on technological interventions used to manage risk and violence within forensic mental healthcare settings by Tully, Larkin and Fahy (2015) includes the emerging use of adapted closed-circuit television (CCTV) and infrared light technologies to provide contact-free monitoring of service user safety and vital signs. The technology has been trialled in a high secure hospital and functions in both daylight or darkness such that staff do not need to enter service users' bedrooms to undertake observations and potentially disrupt sleep. It is noted that the system uses standard hardware and as staff are automatically alerted to any detected concerns about service user safety, no manual data processing or review of the video footage is required.

Sleep quality and sleep disturbance are interrelated with mental distress (Abad & Guilleminault, 2005) and the literature highlights the potential within mental healthcare for sound-related interventions including technology, to mitigate sleep disturbance, promote sleep and improve sound quality within sleeping environments.

" I love the sound of birdsong, by the way. That's beautiful for when you're trying to relax...I guess it's peace, isn't it? It's serenity, to hear birdsong."

[Participant] (Ratcliffe et al., 2013 p.224)

Sound of nature

Views of nature have been shown to reduce patient recovery time in hospital (Ulrich, 1984) and whilst a body of research supports the restorative visual effects of nature within healthcare contexts, research examining the impact of natural sound on health outcomes is more limited (lyendo, 2016).

A randomised controlled trial by Saadatmand et al. (2013) involving patients receiving mechanical ventilator support in an intensive care unit examined the effect of naturebased sounds on patients' levels of agitation, anxiety and physiological stress. Patients in the experimental group listened through headphones to 90 minutes of nature-based sounds, whilst the control group listened only to silence. Physiological measures undertaken before, during and after the sound intervention, together with anxiety and agitation assessments, indicated significantly lower levels of blood pressure, anxiety and agitation in the intervention group when compared with the control. It is suggested that the findings provide support for naturebased sounds as a non-pharmacological intervention for stress and anxiety reduction.

Alvarsson, Wiens and Nilsson (2010) examined the effect of auditory stimulation on the recovery of healthy participants experiencing psychological stress induced by a challenging mental arithmetic test. Following the test, participants listened either to pleasant natural sounds, including birdsong and a water fountain, or to urban sounds, including traffic noise. Skin conductance level testing indicated that exposure to natural sounds promoted more rapid physiological recovery of the sympathetic nervous system following psychological stress, when compared with the effects of noisy urban sounds.

Kjellgren and Buhrkall (2010) compared the restorative effect of a natural forest environment on people experiencing stress or burn-out, with that of a simulated forest environment. Following tests to induce stress, participants relaxed for 30 minutes within a natural forest setting and the process was repeated in a laboratory condition in which participants reviewed a slideshow of forest photographs. Qualitative data findings indicated a perception of sensory incompleteness in the simulated environment, which is described as 'missing the smells and sounds' (p.470) of nature.

Contrasting accounts of the natural forest as a complete sensory experience suggest that the light, smells and sounds of the forest, including birdsong are able to induce a sense of calm and relaxation. Physiological and psychological measures indicated that whilst both environments promoted stress reduction, the natural environment additionally produced significantly higher perceived levels of energy and altered states of consciousness in participants, which it is suggested might enhance and promote restoration.

In a qualitative study by Ratcliffe, Gatersleben and Sowden (2013), healthy participants' accounts of natural environments which were perceived to have restorative benefits following imagined exhaustion or stress, included references to sounds within nature. Content analysis identified that birdsong comprised 35% of the natural sounds discussed and was the most frequently mentioned natural sound in relation to perceptions of stress recovery or attention restoration, followed by water sounds (24%).

Although generic birdsong was typically described positively and perceived to be restorative, perceptions varied between bird species and participants' personal associations with different birds. Accounts suggested that bird sounds associated with aggression or threat tended to be perceived less positively and less likely to promote restoration.

Although research examining the effect of naturebased sounds on health is limited, existing studies suggest that natural sounds, such as bird song and flowing water, are commonly perceived positively and may promote restorative health benefits, including stress and anxiety reduction (lyendo, 2016).



Sound of Nature

Sound and music

Music has been associated with healing for thousands of years and cultures throughout the world have used music as a form of medicine to promote mental and physical equilibrium (Iyendo, 2016; Solanki, Zafar, & Rastogi, 2013).

In contemporary healthcare, musical experience and interaction within a therapeutic relationship is commonly defined as music therapy, whilst other forms of musical intervention without therapist involvement are typically described as music medicine or music listening (Gold, 2009). Forms of music therapy may also be termed 'active', in which service users and therapists use their voices and instruments to create music. or 'receptive', whereby service users listen to music whilst engaging with a therapist (Solanki et al., 2013).

A literature review exploring the impact of music and sound on health undertaken by Iyendo (2016) highlights the positive role of sound interventions within healthcare settings. The results of the review suggest that listening to music and nature sounds can possess a soothing quality which may induce positive emotions in service users and staff. It was also found that music listening interventions can reduce stress levels, blood pressure and post-operative trauma, when compared to silence.

Chan, Wong and Thayala (2011) conducted a systematic review of studies examining the effect of music listening interventions in mediating symptoms of low mood in adults within inpatient and community settings and found that symptoms may be reduced over time through music listening. It is suggested that facilitating individual music choice is significant to the effect of music listening and that all music types may be effective, depending on individual preferences. Whilst daily listening did not appear to have a greater effect than weekly listening, the authors propose that music listening should be repeated regularly over a period of more than 3 weeks in order to develop a cumulative effect.

A randomised controlled trial by Lu et al. (2013) examined the impact of group music therapy on ameliorating psychiatric symptoms and low mood in people with a diagnosis of schizophrenia receiving care in a psychiatric nursing home. Participants in the intervention group took part in 60 minutes of group music therapy twice weekly for five weeks, whilst a control group received standard care without any intervention. Sessions involved music selected following

¹It's one of the few things that really helps me get rid of these driving thoughts...You follow the music instead of grinding round and round in your head all the time."

[Service user 2] (Solli & Rolvsjord, 2015 p.81)

a service user survey and the study findings indicated a significant reduction in psychiatric symptoms and low mood in the intervention group following the music therapy. This improvement was not maintained at a 3-month follow-up, however, which may be explained by the discontinuation of the intervention during this period.

Gold, Solli, Krüger and Lie (2009) undertook a systematic review and meta-analysis of studies examining the benefits of music therapy for people experiencing serious mental distress, based on a range of clinical diagnoses. Irrespective of diagnosis, the findings indicate that when added to standard care, music therapy can have a strong and significant impact on clinical measurements of service users' general mental state, symptom levels and levels of functioning. Effects of music therapy were found to be associated with the number of sessions provided, such that whilst a few sessions may lead to minor improvements, more substantial benefits may require a greater number or frequency of sessions.

Whilst experimental studies examining the impact of music therapy are predominantly focused on outcome measures, such as symptom reduction, Solli and Rolvsjord (2015) present a qualitative study exploring accounts of participating in music therapy from service users experiencing psychosis. The findings suggest that music therapy may not necessarily be perceived as a form of treatment, but as a place in which a sense of freedom, connection and vitality might be experienced. The findings indicate group music therapy to generally be perceived as an enjoyable, social and motivating experience, with individual accounts also suggesting that active music playing in particular may moderate the experience of intrusive thoughts or voice hearing.

Sound and Music

Research findings suggest that individual choice is a key factor in contributing to the effect of music listening (Chan et al., 2011) and that music can be cost effective as a non-pharmacological intervention, which may promote positive physiological and psychological health outcomes (Solanki et al., 2013).

"The fact that it's an open space it echoes. Every little noise, it's amplified a few times... So there's a lot of noise... that must be quite disconcerting."

[Staff participant] (Brown et al., in preparation)

Sound and space

Research findings suggest that whilst service user experiences and outcomes may be improved within newly built hospitals, the design of healthcare facilities may commonly be focused on visual or spatial aspects of the environment, with limited emphasis on acoustic quality, noise control and the overall experience of sound within these spaces (Lawson, Phiri, & Wells-Thorpe, 2003).

Lawson et al., (2003) compared service user outcomes and perceptions of the environment within an existing psychiatric hospital and a new build mental health facility.

The findings indicated that although perceptions of visual environmental qualities were significantly improved within the new hospital, there was very little improvement in service users' appraisals of environmental comfort or control, notably in relation to perceived high levels of ambient noise.

As perceiving a lack of environmental control within healthcare settings has been shown to promote anxiety and stress responses in service users, a key principle of the supportive design theory put forward by Ulrich (1991) includes enabling a sense of individual control over physicalsocial surroundings. Accordingly, it is suggested that perceptions of a lack of control over unwanted noise can be



significant to the well-being of occupants in healthcare environments (Mazuch & Stephen, 2007).

Wood et al., (2013) examined the experiences of visitors, service users and staff within a newly built mental healthcare unit and explored perceptions of the new facility when compared with the existing psychiatric hospital which it had replaced. Although participants recognised the need for private spaces in the new hospital, it was noted that there was no designated private family visiting room on the acute wards and that spaces for visiting were shared with quiet rooms. Whilst visits typically took place in the communal lounge, it was reported that acoustic conditions within the common areas generated unpleasantly high noise levels. Participant accounts also suggested that a courtyard garden space by comparison provided a more comfortable and relaxing environment for visits.

Similarly, the role of space in affording both privacy and respite from high noise levels is highlighted in an exploratory study by Isobel, Foster and Edwards (2015), examining nurses' perceptions about the development and use of designated family visiting rooms within inpatient mental health facilities. Whilst the overall ward is described by a participant as being 'a very noisy environment' (p.6), the family room by contrast is

perceived as 'a nice little sanctuary' (p.6). The study findings also suggest that the provision of private visiting spaces contributes towards the sense of a therapeutic landscape within mental healthcare environments and acknowledges service users' need for privacy and social connection with friends and family, including children.

The findings of research undertaken by Brown, Kanyeredzi, McGrath, Reavey and Tucker (in preparation) within a large newly built medium secure forensic mental health facility indicate that whilst certain visual and spatial aspects of the new building had been designed to reduce perceptions of a restrictive institutional environment, this was less easily achieved within the acoustic environment.

Service user and staff accounts suggest that whilst spatial attributes such as high ceilings and large open spaces had been incorporated to optimise a sense of space and light, these features also contributed to the generation of high noise levels and the reverberation of sound sources. In turn, the exacerbation of sound sources including slamming doors and jangling keys was found to contribute to perceptions of incarceration and associations with punitive environments.

In describing the approach to planning and designing a new secure forensic mental health facility Dvoskin et al., (2002)

highlight the significance of ambient noise levels as a stressor in psychiatric settings. Whilst strong emotions might typically be expressed through raised voices, it is suggested that voices may often be raised simply to be heard amidst constantly high noise levels, which in turn may result in alternative expressions of strong feeling, including aggression. Incorporating sound management into the design approach was therefore considered to be an important measure to promote safety and reduce levels of aggression in the environment. The integration of acoustic materials, including sound-absorbing plasterboard to walls and ceilings is similarly suggested in design guidance for new build behavioural healthcare environments (Hunt & Sine, 2017).

Although research examining sound within mental healthcare spaces is limited, studies suggest that the auditory environment is significant to the experience of service users, staff and visitors, such that the acoustic properties of space warrant equal design consideration alongside visual and physical features in the development of mental healthcare environments (Lawson et al., 2003).

Sound interpretation

Research examining hospital sound has typically focused on the impact of noise perceived as unwanted sound, with limited exploration of the ways in which sounds may be interpreted or convey meaning within healthcare environments (Brown, Rutherford, & Crawford, 2015; lyendo, 2017).

Brown, Rutherford and Crawford (2015) draw on the concept of the 'soundscape' as a space within which distinctive sounds are imbued with social meaning (Schafer, 1994) and highlight how sound and acoustics enable service users and staff to negotiate and understand healthcare environments. Building on the premise that positive perceptions of sound may also promote healing, it is suggested that silence does not necessarily constitute the optimum soundscape in hospitals, but that greater consideration should be given to improving the clarity and intelligibility of sound sources.

"Well here you get them cleaning the floor with the machine, trollies coming down, beds being moved, there is something going on all the time."

[Service user] (Mackrill et al., 2013 p.3)

In ethnographic research (based on observation), Rice (2003) explores perceptions of the soundscape in a general hospital, highlighting the ways that sound is imposed on occupants

and proposing that a relative lack of sensory stimulation within healthcare environments might lead to a heightened sensitivity in hearing. Whilst interpreting sound allows service users to navigate and understand activities or routines, the findings suggest that perceptions of the soundscape also serve as a constant reminder for occupants of their status as hospital patients. Staff also use hearing to monitor the ward and in reference to the established concept of 'panopticanism' as a theorisation of visual surveillance by an authority (Foucault, 1975), Rice adopts the term 'panauralism' to describe the monitoring function of listening for hospital staff.

In the context of a newly constructed medium secure forensic psychiatric unit, Brown, Kanyeredzi, McGrath, Reavey and Tucker (in preparation) examine meaning making in relation to service user and staff experiences of sound. Attention is drawn to the immersive nature of hearing, which is continually 'switched on' in contrast to vision. such that occupants, particularly within a restrictive environment, cannot easily avoid unwanted sound. Staff are also commonly attuned to the ward atmosphere using listening practices, whereby unrest might be sensed through hearing long before it is seen. Whilst staff may 'listen out' especially when entering a ward, this sense of attunement was found to be disrupted in entrance corridors where sounds were reflected and not easy to localise. Within a secure environment where televisions are typically communal, participant accounts also suggest that a shared interest in the television output can generate positive relationships, but the ward atmosphere may easily become unsettled if the acoustic environment is dominated by individual viewing preferences.

Participant accounts indicate that sound, including shared music listening or making, can offer a source of connectivity to other people and contexts, yet that the noise from competing sound sources, including voices or music, can result in a sense of disconnection with others. As a means to obtain auditory respite, it is suggested that for some occupants, the prospect of solitary confinement or referral to a psychiatric unit may be preferable to the experience of overwhelming noise levels within the general environment.

In research examining auditory experiences within prison settings, Hemsworth (2016) similarly highlights the emotive and symbolic qualities of sound and the ways in which listening provides information such that occupants may 'feel' and monitor the environmental atmosphere. Although sound offers vital spatial knowledge and orientation within these restrictive environments, conversely it is noted that sonic qualities such as reverberation can also be disorienting and distressing. The crashing sound of riot squad footsteps is described as being intimidating, particularly to occupants with a diagnosis of post-traumatic stress disorder who may associate sounds with difficult past experiences.

Mackrill, Cain and Jennings (2013) examined the subjective responses of patients and staff to the soundscape of a cardiothoracic ward and highlight how sounds may elicit emotional responses and also provide orientation to occupants within healthcare environments. Participants' accounts included both positive and negative responses to the ward soundscape and perceptions were found to relate not only to particular sounds such as voices or equipment, but also to the social, physical and temporal context in which the sounds may be heard. The findings suggest that the interpretation of sound may affect perception, such that understanding and acceptance of sound sources may result in more positive perceptions of sound. Positive sound associations included birdsong heard through the hospital windows and sounds of ward activity, such as the noise of the tea trolley. It is also suggested that environmental conditions, including lighting and temperature can influence staff and patient mood, which may in turn impact on perceptions of the soundscape.

Although studies exploring the acoustic environment within hospitals are commonly focused on examining the negative impact of noise or the reduction of sound levels, further research is required to explore interpretations of the soundscape and how different perceptions of sound may contribute to the health and experience of service users, visitors and staff (Brown et al., 2015; Iyendo, 2016).

"For me, the most helpful was that opportunity the sensory room gave me to have a quiet, relaxing space on the ward...it's a safe space..."

[Service user 13] (Sutton & Nicholson, 2011 p.26)

Sound experience

Research findings indicate a relationship between heightened noise sensitivity and mental distress (Stansfeld, 1992; Sutton & Nicholson, 2011), such that the ways in which noise and the overall acoustic environment may be experienced by individuals is of particular significance within mental healthcare settings.

Westman and Walters (1981) explore the relationship between noise and stress and draw attention to the fundamental purpose of hearing as a defence mechanism, through which emotional and physical responses to sound are induced via the autonomic nervous system. Whilst human hearing was designed to respond to the frequencies and intensities of sounds in nature, it is argued that evolutionary processes have not yet allowed for adaption to loud modern sound sources, such that the auditory system can become overloaded and interfere with natural rhythms (e.g. as found in sleep patterns etc.). In accordance with primitive survival instincts, the meaning associated with sound is one of the most important factors in determining human responses, whereby sounds perceived to be threatening signify danger. Difficult past experiences involving threat, harm and danger are not uncommon in individuals who access mental health services, and a person's sound scape in hospital, perceived to be threatening and arousing may be particularly challenging and reignite feelings of powerlessness (Johnstone & Boyle, 2018).

Sensory modulation involves regulating the degree to which an individual is influenced by sensory stimuli and it is suggested that people experiencing mental distress may be hypo or hyper sensitive to sensory stimuli, including noise, light, touch and vestibular input, relating to movement and balance (Sutton & Nicholson, 2011). Difficulties in modulating sensory input may contribute to distress (as found in individuals diagnosed with anxiety and psychosis) and may also then be considered responses to the specific threats associated with these forms of distress. The emerging field of sensory modulation approaches within mental healthcare includes the use of sensory-based interventions and sensory environments which are designed to be tailored to suit individual needs (Champagne & Stromberg, 2004; Costa, Donna, Morra, Solomon, Sabino, & Call, 2006).

Sutton and Nicholson (2011) examined service user and staff perceptions about the use of sensory approaches and sensory environments within acute mental healthcare settings. Whilst the rhythmic sound of waves was reported to be helpful for some during an experience of anxiety, loud music with lyrics created an external distraction from voice hearing for others; music listening based on individual preferences was similarly found to disrupt intrusive thoughts. Sensory environments were commonly perceived to offer a safe space away from activity on the ward and for many service users the most effective means of decreasing levels of arousal was to escape from noise and artificial light.

Participant accounts indicated that sensory environments and approaches enabled the development of tools to self-manage distress both on the ward and in the community. It was also suggested that sensory approaches may reduce rates of pro re nata (PRN) treatment (medication which is dispensed as needed) and increase a sense of empowerment.

A systematic literature review undertaken by Machingura, Shum, Molineux and Lloyd (2017) examined the use of sensory modulation approaches in the treatment of adults with a diagnosis of schizophrenia. Notwithstanding further research is recommended, the review identified preliminary support for the existence of sensory modulation difficulties in people with a diagnosis of schizophrenia and for the efficacy of reducing distress in acute mental healthcare settings through the use of sensory modulation approaches.

The acoustic environment may be particularly challenging for individuals using mental health services, due to past difficult experiences and present heightened arousal. Consideration should be given to how sound may exacerbate feelings of threat and powerlessness and how sensory approaches might help.



Sound scapes

Whilst studies concerned with the subjective experience of sound in healthcare environments have commonly focused on noise reduction, the premise that improving soundscape perceptions may involve more than simply reducing sound levels (e.g. Mackrill, Cain, & Jennings, 2013) has been explored in research examining ways in which positive soundscapes might be designed to promote well-being.

A review of studies examining the effect of sound as a supportive design intervention in healthcare environments undertaken by Ivendo (2017), found that whilst noise can promote stress and hinder recovery, natural sounds including birdsong, gentle wind and waves can contribute to perceptions of restoration and stress recovery. It is therefore suggested that pleasant natural sound might be considered by clinicians as an unobtrusive, non-pharmacological intervention which might be implemented as part of routine care to promote patient recovery from medical procedures.

Mackrill, Jennings and Cain (2014) undertook research with healthy participants in a sound lab setting to examine how sound interventions may affect subjective responses to recordings of an existing hospital ward soundscape. Participants rated their perceived levels of 'relaxation' and 'interest and understanding' in response to clips of the existing soundscape and clips into which either natural sound (birdsong and flowing water), or steady state sound (the constant sound of sterilising equipment used to mask other sounds) were incorporated.

In a third intervention, participants received written information describing the various sources of sounds within the existing soundscape. The three interventions created a small, but significant effect in the 'relaxation' dimension, with written sound source information and natural sound producing the largest effect on soundscape perception, and steady state sound generating a lesser effect. Although a 10.1% positive change in soundscape perception was generated by natural sound, participant responses also included comments such as, "the sound of running water didn't fit" and the birdsong "could get too much if 'piped' in" (p.1457), which suggest that consistency between auditory and visual stimuli is relevant to the acceptance of sound.

A study by Watts, Khan and Pheasant (2016) explored how patients' self-reported anxiety and levels of perceived







"I find hospital make[s] me feel claustrophobic. The birdsong and water make it feel less so like being next to a window."

[Participant 19] (Mackrill et al., 2014 p.1457)

tranquillity, might be affected by combined changes to the soundscape and visual design of a student health centre reception area. In the intervention condition, the sound of gentle waves replaced the existing sound of music radio and large photographs containing scenes from nature replaced existing notice boards displaying health-related leaflets. Perceptions of the existing and adjusted environment were compared and the findings indicated that participants' reported rates of perceived tranquillity were significantly improved in the intervention condition. A reduction in perceived levels of anxiety in the altered environment was also reported by participants who had experienced the environment in both the existing and adjusted conditions.

A multi-centre study by Thorgaard et al. (2005) examined patient and staff perceptions of a designed sound environment within five post-anaesthesia care units. The designed sound was played through ceiling speakers and comprised specially composed music based on nature sounds, gentle instrumental sounds and voices. When surveyed, 83% of the patient participants described the sound environment as pleasant or very pleasant, 6% perceived it to be unpleasant and 11% reported having no opinion.

The study also indicated a strong correlation between a positive response to the designed sound environment and patients' reported levels of relaxation and satisfaction with their stay. Although the sound intervention was added to the existing sound of the recovery wards, such that sound levels were likely to have increased, the majority of staff members reported a positive response to the designed sound, including perceptions of reduced sound levels and reduced distress in the working environment.



There is currently a limited evidence-base of research examining the ways in which positive soundscape interventions might impact on the health and experience of service users and staff within healthcare environments. Further research is required to investigate how soundscapes might be designed as part of an integrated environment within healthcare settings and to explore how emotional responses to sound may reflect perceptions of hospital environments (Iyendo, 2017; Iyendo, Uwajeh, & Ikenna, 2016).

Sound Design

"What does good mental health sound like?" (www.madlove.org.uk)

Soundbites from **Madlove**

Madlove are a collective led by experts by experience, and includes practitioners, academics and non-experts working towards improving environments for people who live with distress. Their central research project 'A Designer Asylum' canvassed opinion across a broad range of individuals to establish what an ideal 'safe space' to 'go mad in' would involve. Based on the idea of a sensory pallet, where all aspects of people's lived experience are accounted for, they considered key questions that included 'what good mental health 'sounds' like' (as well as what it looks like, smells like and tastes like etc).

Madlove's aim was to generate and interpret this data to identify possibilities for hope, safety and well-being in mental health care-environments. They found that it was the everyday and natural sounds that individuals highlighted to be the most soothing and positive – such as rain falling, a cat purring or a bird singing.

They also pointed towards a need for spaces to be designed to accommodate sounds that would traditionally be viewed negatively, such as a cushioned space in which to scream and vent frustration. They argue that a broad range of acoustic needs are central to making spaces safer, and more conducive to recovery.





e shictling hettle







Sound Impact

Akansel, N., & Kavmakci, S. (2008). Effects of intensive care unit noise on patients: A study on coronary artery bypass graft surgery patients. Journal of Clinical Nursing, 17(12), 1581-1590. http://doi.org/10.1111/j.1365-2702. 2007.02144.x

Busch-Vishniac, I.J., West, J. E., Barnhill, C., Hunter, T., Orellana, D., & Chivukula, R. (2005). Noise levels in Johns Hopkins Hospital. The Journal of the Acoustical Society of America, 118(6), 3629-3645. http://doi.org/10.1121/1.2118327

Crowley, J. J. (2000). A clash of cultures: A&E and mental health. Accident and Emergency Nursing, 8(1), 2–8. http://doi.org/10.1054/aaen. 1999 0061

Holmberg, S. K., & Coon, S. (1999). Ambient sound levels in a state psychiatric hospital. Archives of Psychiatric Nursing, 13(3), 117–126. http://doi.org/10.1016/ S0883-9417(99)80042-9

Hsu, T., Ryherd, E. E., Waye, K. P., & Ackerman, J. (2012). Noise pollution in hospitals: Impact on patients. Journal of Clinical Outcomes Management, 19(7), 301–309.

Joseph, A., & Ulrich, R. (2007), Sound control for improved outcomes in healthcare settings. The Center for Health Design. Concord, CA. Retrieved from https://www. healthdesign.org/knowledgerepository/sound-control-improvedoutcomes-healthcare-settings

Ryherd, E. E., Okcu, S., Ackerman, J., Zimring, C., & Waye, K. P. (2012). Noise pollution in hospitals: Impacts on staff. Journal of Clinical Outcomes Management, 19(11), 491-500.

Summers, M., & Happell, B. (2003). Patient satisfaction with psychiatric services provided by a Melbourne tertiary hospital emergency department. Journal of Psychiatric and Mental Health Nursing, 10(3), 351-357. http://doi.org/https://doi. org/10.1046/j.1365-2850.2003.00600.x

Ulrich, R. S., Zimring, C., Quan, X., & Joseph, A. (2006). The environment's impact on stress. In S. O. Marberry (Ed.), Improving Healthcare with Better Building Design (pp. 37–61). Chicago: ACHE Management Series/Health Administration Press

Sound Control

Blomkvist, V., Eriksen, C. A., Theorell T., Ulrich, R., & Rasmanis, G. (2005). Acoustics and psychosocial environment in intensive coronary care. Occupational and Environmental Medicine, 62(3), e1-e1. http://doi.

org/10.1136/oem.2004.017632 Farrehi, P. M., Nallamothu, B. K., & Navvab, M. (2016). Reducing hospital noise with sound acoustic panels and diffusion: A controlled study. BMJ Quality and Safety, 25(8), 644-646. http://doi.org/10.1136/bmjqs-2015 -004205

Hagerman, I., Rasmanis, G., Blomkvist V., Ulrich, R., Eriksen, C. A., & Theorell, T (2005) Influence of intensive coronary care acoustics on the quality of care and physiological state of patients International Journal of Cardiology, 98(2), 267-270. http://doi. org/10.1016/j.ijcard.2003.11.006

Joseph, A., & Ulrich, R. (2007). Sound control for improved outcomes in healthcare settings. The Center for Health Design, Concord, CA, Retrieved from https://www.healthdesign. org/knowledge-repository/ sound-control-improved-outcomeshealthcare-settings

Karlin, B. E., & Zeiss, R. A. (2006). Environmental and therapeutic issues in psychiatric hospital design: Toward best practices. Psychiatric Services, 57(10), 1376-1378. http://doi. org/10.1176/ps.2006.57.10.1376

MacLeod, M., Dunn, J., Busch-Vishniac, I. J., West, J. E., & Reedy, A. (2007). Quieting Weinberg 5C: a case study in hospital noise control. Journal of the Acoustical Society America, 121(6), 3501-3508. http://doi.org/10.1121/1.2723655

Ryherd, E. E., West, J. E., Busch-Vishniac, I. J., & Persson Wave, K. (2008). Evaluating the hospital soundscape. Acoustics Today, 4(4), 22-29. http://doi. org/10.1121/1.3058487

Abad, V. C., & Guilleminault, C. (2005) Sleep and psychiatry. Dialogues in Clinical Neuroscience, 7(4), 291-303.

Berg, S. (2001). Impact of reduced reverberation time on sound-induced arousals during sleep. Sleep, 24(3), 289-292. http://doi.org/10.1093/ sleep/24.3.289

de Niet, G., Tiemens, B., & Hutschemaekers G (2010) Can mental healthcare nurses improve sleep quality for inpatients? British Journal of Nursing, 19(17), 1100-1105. http://doi.org/10.12968/bjon.2010.19. 17,78558

Doğan, O., Ertekin, Ş., & Doğan, S. (2005). Sleep quality in hospitalized patients. Journal of Clinical Nursing, 14, 107–113. http://doi.org/10.1111/j. 1365-2702.2004.01011.x

Kamphuis, J., Dijk, D. J., Spreen, M., & Lancel, M. (2014). The relation between poor sleep, impulsivity and aggression in forensic psychiatric patients. Physiology and Behavior, 123, 168–173. http://doi.org/10.1016/ i.physbeh.2013.10.015

Kamphuis, J., Karsten, J., de Weerd. A.. & Lancel, M. (2013), Sleep disturbances in a clinical forensic psychiatric population, Sleep Medicine, 14(11). 1164-1169. http://doi.org/10.1016/j. sleep.2013.03.008

Southwell, M. T., & Wistow, G. (1995). Sleep in hospitals at night: Are patients' needs being met? Journal of Advanced Nursing, 21(6), 1101–1109.

Tully, J., Larkin, F., & Fahy, T. (2015). New technologies in the management of risk and violence in forensic settings. CNS Spectrums, 20(3) 287–294. http://doi.org/10.1017/ S1092852915000279

Sound of Nature

Alvarsson, J. J., Wiens, S., & Nilsson, M. E. (2010). Stress recovery during exposure to nature sound and environmental noise. International Journal of Environmental Research and Public Health, 7(3), 1036–1046. http://doi.org/10.3390/ijerph7031036

Iyendo, T. O. (2016). Exploring the effect of sound and music on health in hospital settings: A narrative review. International Journal of Nursing Studies, 63, 82-100. http://doi org/10.1016/j.ijnurstu.2016.08.008

Kjellgren, A., & Buhrkall, H. (2010). A comparison of the restorative effect of a natural environment with that of a simulated natural environment. Journal of Environmental Psychology, 30(4), 464-472. http://doi. org/10.1016/j.jenvp.2010.01.011

Mackrill, J., Cain, R., & Jennings, P.

(2013). Experiencing the hospital

36, 1-8. http://doi.org/10.1016/j.

ward soundscape. Towards a model

Journal of Environmental Psychology,

Sound and Sleep

Medvedev, O., Shepherd, D., & Hautus, M.J. (2015). The restorative potential of soundscapes: A physiological investigation. Applied Acoustics, 96, 20-26. http://doi.org/10.1016/j. apacoust.2015.03.004

ienvp.2013.06.004

Ratcliffe, E., Gatersleben, B., & Sowden, P.T. (2013). Bird sounds and their contributions to perceived attention restoration and stress recovery. Journal of Environmental Psychology, 36, 221-228. http://doi. org/10.1016/j.jenvp.2013.08.004

Saadatmand, V., Rejeh, N., Heravi-Karimooi, M., Tadrisi, S. D., Zayeri, F., Vaismoradi, M., & Jasper, M. (2013). Effect of nature-based sounds' intervention on agitation, anxiety, and stress in patients under mechanical ventilator support: A randomised controlled trial. International Journal of Nursing Studies, 50(7), 895-904. http://doi.org/10.1016/j.ijnurstu. 2012.11.018

Ulrich, R. S. (1984). View through a window may influence recovery from surgery. Science, 224, 420-421. http:// doi.org/10.1126/science.6143402

Sound and Music

Chan, M. F., Wong, Z. Y., & Thayala, N. V. (2011). The effectiveness of music listening in reducing depressive symptoms in adults: A systematic review. Complementary Therapies in Medicine, 19(6), 332-348, http://doi org/10.1016/i.ctim.2011.08.003

Gold, C. (2009). All those things with music. Nordic Journal of Music Therapy, 18(1), 1-2, http://doi. org/10.1080/08098130802712043

Gold, C., Solli, H. P., Krüger, V., & Lie, S. A. (2009). Dose-response relationship in music therapy for people with serious mental disorders: Systematic review and meta-analysis. Clinical Psychology Review, 29(3), 193-207. http://doi.org/10.1016/j.cpr. 2009.01.001

lyendo, T. O. (2016). Exploring the effect of sound and music on health in hospital settings: A narrative review International Journal of Nursing Studies, 63, 82-100. http://doi org/10.1016/j.ijnurstu.2016.08.008

Lu, S. F., Lo, C. H. K., Sung, H. C., Hsieh, T. C., Yu. S. C., & Chang, S. C. (2013). Effects of group music intervention on psychiatric symptoms and depression in patient with schizophrenia Complementary Therapies in Medicine, 21(6), 682-688. http://doi.org/ 10.1016/i.ctim.2013.09.002

Solanki, M. S., Zafar, M., & Rastogi, R. (2013). Music as a therapy: Role in psychiatry. Asian Journal of Psychiatry, 6(3), 193–199. http://doi.org/10.1016/ i.aip.2012.12.001

Solli, H. P., & Rolvsjord, R. (2015). "The Opposite of Treatment": A qualitative study of how patients diagnosed with psychosis experience music therapy. Nordic Journal of Music Therapy, 24(1), 67–92. http://doi.org/10 1080/08098131.2014.890639

Sound and Space

Brown, S.D., Kanveredzi, A., McGrath, L., Reavey, P. & Tucker, I. (in preparation). Bangs and clinks: Examining the acoustic atmosphere of a forensic mental health inpatient unit. Submitted to Human Relations.

Dvoskin, J. A., Radomski, S. J., Bennett, C., Olin, J. A., Hawkins, R. L., Dotson, L. A., & Drewnicky, I. N. (2002). Architectural design of a secure forensic state psychiatric hospital. Behavioral Sciences & the Law, 20(5), 481-493. http://doi.org/10.1002/ bsl.506

Hunt, J. M., & Sine, D. M. (2017). Design guide for the built environment of behavioral health facilities. Facilities Guidelines Institute Retrieved from https://www.fgiguidelines.org/

Isobel S. Foster K. & Edwards C. (2015). Developing family rooms in mental health inpatient units: an exploratory descriptive study. BMC Health Services Research, 15(238), 1-9. http://doi.org/10.1186/ s12913-015-0914-0

Lawson, B., Phiri, M., & Wells-Thorpe, J. (2003). The architectural healthcare environment and its effects on patient health outcomes: A report on an NHS Estates Funded Research Project. London: The Stationery Office.

Mazuch, R., & Stephen, R. (2007). Creating healing environments: Humanistic architecture and therapeutic design. Journal of Public Mental Health, 4(4), 48-52, http://doi. org/10.1108/17465729200500031

Ulrich, R. S. (1991). Effects of interior design on wellness: Theory and recent scientific research Journal of Healthcare Interior Design, 3(1), 97-109

Wood, V. J., Curtis, S. E., Gesler, W., Spencer, J. H., Close, H. J., Mason, J., & Reilly, J. G. (2013), Creating "therapeutic landscapes" for mental health carers in inpatient settings: A dynamic perspective on permeability and inclusivity. Social Science & Medicine, 91, 122-129. http://doi. org/10.1016/j.socscimed.2012.09.045

Sound Interpretation

Brown, B., Rutherford, P., & Crawford, P. (2015). The role of noise in clinical environments with particular reference to mental health care: A narrative review. International Journal of Nursing Studies, 52(9), 1514-1524. http://doi.org/10.1016/j.ijnurstu. 2015 04 020

Brown, S.D., Kanyeredzi, A., McGrath, L., Reavey, P. & Tucker, I. (in preparation). Bangs and clinks: Examining the acoustic atmosphere of a forensic mental health inpatient unit. Submitted to Human Relations.

Foucault, M. (1975). Discipline and punish: The birth of the prison. London: Penguin.

Hemsworth, K. (2016). "Feeling the range": Emotional geographies of sound in prisons. Emotion, Space and Society, 20, 90-97. http://doi. org/10.1016/j.emospa.2016.05.004

lyendo, T. O. (2016). Exploring the effect of sound and music on health in hospital settings: A narrative review International Journal of Nursing Studies, 63, 82-100. http://doi.org/ 10.1016/i.jinurstu.2016.08.008

lyendo, T. O. (2017). Sound as a supportive design intervention for improving health care experience in the clinical ecosystem: A qualitative study. Complementary Therapies in Clinical Practice, 29, 58-96. http://doi. org/10.1016/j.ctcp.2017.08.004

Mackrill, J., Cain, R., & Jennings, P. (2013). Experiencing the hospital ward soundscape: Towards a model. Journal of Environmental Psychology, 36, 1-8. http://doi.org/10.1016/j.jenvp. 2013.06.004

Rice, T. (2003), Soundselves; An acoustemology of sound and self in the Edinburgh Royal Infirmary. Anthropology Today, 19(4), 4–9.

Schafer, R. M. (1994). The soundscape: Our sonic environment and the tuning of the world. Rochester, Vermont: Destiny Books.

Sound Experience

Champagne, T., & Stromberg, N. (2004). Sensory approaches in inpatient psychiatric settings: Innovative alternatives to seclusion and restraint. Journal of Psychosocial Nursing, 42(9), 34-44, http://doi. org/10.3928/02793695-20040301-01

Costa, Donna, M., Morra, J., Solomon, D Sabino M & Call K (2006) Snoezelen and sensory-based treatment for adults with psychiatric disorders, OT Practice, 11(4), 19-23.

Johnstone, L., & Boyle, M. (2018). The Power Threat Meaning Framework: Towards the identification of patterns in emotional distress, unusual experiences and troubled or troubling behaviour, as an alternative to functional psychiatric diagnosis. Leicester: British Psychological Society.

Mackrill, J., Cain, R., & Jennings, P. (2013). Experiencing the hospital ward soundscape: Towards a model. Journal of Environmental Psychology, 36, 1-8. http://doi.org/10.1016/j. jenvp.2013.06.004

Mackrill, J., Jennings, P., & Cain, R. (2014). Exploring positive hospital ward soundscape interventions. Applied Ergonomics, 45(6). 1454–1460. http://doi.org/10.1016/j. apergo.2014.04.005

References

Machingura, T., Shum, D., Molineux, M., & Lloyd, C. (2017). Effectiveness of sensory modulation in treating sensory modulation disorders in adults with Schizophrenia: a Systematic literature review. International Journal of Mental Health and Addiction, 1-17. http://doi. org/10.1007/s11469-017-9807-2

Stansfeld, S. . (1992). Noise, noise sensitivity and psychiatric disorder: Epidemiological and psychophysiological studies. Psychological Monograph Supplement, 22, 1–44. http://doi.org/doi.org/10.1017/ S0264180100001119

Sutton, D., & Nicholson, E. (2011). Sensory modulation in acute mental health wards: A qualitative study of staff and service user perspectives. Auckland: The National Centre of Mental Health Research, Information and Workforce. Retrieved from http://www.tepou.co.nz/library/tepou/ sensory-modulation-in-acutemental-health-wards-a-qualitative study-of-staff-and-service-user-

Westman, J. C., & Walters, J. R. (1981). Noise and stress: A comprehensive approach. Environmental Health Perspectives, Vol. 41(October), 291-309. http://doi.org/10.1289/

Sound Design

perspectives

ehp.8141291

lyendo, T. O. (2017). Sound as a supportive design intervention for improving health care experience in the clinical ecosystem: A qualitative study. Complementary Therapies in Clinical Practice, 29, 58-96. http://doi. org/10.1016/j.ctcp.2017.08.004

lyendo, T. O., Uwajeh, P. C., & Ikenna, E. S. (2016). The therapeutic impacts of environmental design interventions on wellness in clinical settings: A narrative review. Complementary Therapies in Clinical Practice, 24, 174-188. http://doi.org/10.1016/j. ctcp.2016.06.008

Thorgaard, P., Ertmann, E., Hansen, V., Noerregaard, A., Hansen, V., & Spanggaard, L. (2005). Designed sound and music environment in postanaesthesia care units – A , multicentre study of patients and staff. Intensive and Critical Care Nursing, 21(4), 220-225. http://doi. org/10.1016/j.iccn.2004.10.008

Watts, G., Khan, A., & Pheasant, R. (2016). Influence of soundscape and interior design on anxiety and perceived tranquillity of patients in a healthcare setting. Applied Acoustics, 104, 135-141. http://doi.org/10.1016/j. apacoust.2015.11.007

Design With People in Mind

Professor Paula Reavey

Professor of Psychology and Mental Health, London South Bank University and a Director of the Design in Mental Health Network Email: reaveyp@lsbu.ac.uk 0207 815 6177

Katharine Harding

Associate, Conran and Partners Doctoral Researcher at London South Bank University Email: hardink2@lsbu.ac.uk

Design in Mental Health Network www.dimhn.org

Text © Paula Reavey, Katharine Harding, 2018

Published by the Design in Mental Health Network, May 2018

Printed by London South Bank University

Design and illustration by Lex Johan Set in 8/10pt Akkurat

Picture credits

Pages 24, 25: All images courtesy of madlove.org.uk, and are individually credited

All other images are from www.pexels.com, stocksnap.io and unsplash.com, and conform to the Creative Commons Zero (CC0) license

For citations

Reavey, P., Harding, K. (2018). Design with People in Mind: The Sound Issue, Design in Mental Health Network



