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Experiencing the hospital ward soundscape: Towards a model

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ABSTRACT

Within healthcare design the soundscape or auditory landscape is often overlooked in favour of a focus on sound level. However, sound level is only one aspect of the soundscape. In order to improve healthcare environments it is important to understand the role of sound and to determine what may be positive, negative, and the feelings that different soundscapes can evoke. This paper reports on a semi-structured interview study which aimed to understand individuals' subjective responses to the soundscape of a cardiothoracic ward within a public University Hospital in the UK. A total of 27 in-situ interviews were conducted with patients and nurses and thematic coding was used to develop a conceptual model describing perception. This revealed that the soundscape is a diverse mix of sound sources with perception dependent not only on specific sounds, but also the physical, temporal and social context in which they are heard. Subjectively, the soundscape held both positive and negative aspects. It was found that coping methods were adopted by individuals by accepting and habituating to aspects of the soundscape. The conceptual model highlights potential physical and cognitive interventions that could be explored which may make the soundscape more positively perceived regardless of sound level.

1. Introduction

In recent decades research on healthcare design and planning has highlighted strong relationships between environmental characteristics and human health (Monti et al., 2012). Hospital environments should reduce anxiety and stress, and make patients feel comfortable and safe (Douglas & Douglas, 2004) whilst promoting healing through the creation of an inviting and calming environment (Douglas & Douglas, 2005). As hospitals are behaviour settings where there is a definite relationship between people and the built form (Gesler, Bell, Curtis, Hubbard, & Francis, 2004) relationships of individual to place require understanding through patients' perceptions (Andrews & Evans, 2008).

In the past there has been research into the effect of the built environment on patients in relation to these aspects. Research has linked poor design to psychological and physiological discomfort. Ulrich (1992) remarks that these negative effects can be counteracted by good design. Indeed, patients who viewed trees had shorter post-operative stays, took fewer pain relief drugs and had more favourable comments about their condition in medical notes when matched to patients who viewed a brick wall (Ulrich, 1984).

As such, hospital environments have quality indicators which assess aspects including spatial-physical comfort, orientation, quietness, views and lighting, as well as social function (Andrade, Lima, Fornara, & Bonaiuto, 2012). It is important to take into consideration a user focused approach to the views and perceptions of these attributes (Andrade et al., 2012; Fornara, Bonaiuto, & Bonnes, 2006).

1.1. Sound in hospitals

Often it is preferable to consider the visual aesthetic features of hospital spaces yet healthcare workers ($n = 304$) place sound as the third most important design factor ahead of light, spaciousness, colour, views, and interior/exterior landscaping (Mourshed & Zhao, 2012). This is not surprising since the critical effects of excessive sound levels include sleep disturbance, annoyance, and communication interference (Berglund, Lindvall, & Schewela, 2000).

Research considering sound level cites the World Health Organisation guidelines as a benchmark (Akansel & Kaymakci, 2008; Anand, Wenham, & Bodenham, 2009; Hagerman et al., 2005; Tijunelis, Fitzsullivan, & Henderson, 2005) which generally focus on intensive care units (ICU). Busch-Vishniac et al. (2005) comment on a persistent rise in sound levels since 1968 and recorded mean sound levels ranging from L-eq 50–60 dB(A) (continuous sound level) across five hospital units over a 24 h period within an 11 bed intensive care unit. A-weighting (dB(A)) represents a weighting

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function to mimic the response of the ear which in this case would characterise a sound level similar to a conversation (Haselgrave, 2005) across the time period. Similarly, Akansel and Kaymakci (2008) recorded peak sound levels of 89 dB(A) from footsteps measured at random times during their study which is comparable to that of town traffic (Haselgrave, 2005).

Noise-induced subjective stress among staff and patients has been well documented. Topf and Dillon (1988) suggests sound as an 'ambient stressor' which is likely to cause subjective or physiological stress, increase work pressure, annoyance, fatigue, and burnout among staff (Joseph & Ulrich, 2007; Topf, 2000). Staff who have a reduced locus of control (the degree of control one has over an event e.g. sounds) are more vulnerable to burnout (Schmitz, Neumann, & Oppermann, 2000). Noisy work environments (phones ringing and conversation) were described by 46% of respondents as the major obstacle in intensive care nursing (Gurses & Carayon, 2009) with a three factor model covering factors of auditory fatigue, mental fatigue, and tension caused by hospital sounds in nurses (Waye, Ryherd, Hsu, Lindahl, & Bergbom, 2010). Annoyance from sound is significantly related to auditory fatigue ($p = <.001$) and mental fatigue ($p = <.05$) (Waye et al., 2010).

Objective figures only represent one aspect of sound as hospitals have numerous sources. Siebein and Skelton (2009) classified 75 sound events under five categories within a neonatal ward including occupational, medical equipment, conversational, building equipment, and intruding noise from outside. This demonstrates the array of sounds within healthcare facilities. The perception of the sound environment in a critical care unit described as "*very noisy*", "*awful*", and made people want to "*run out the room*" (Xie & Kang, 2010). Therefore, sound distracts, alters concentration, and increases tiredness amongst staff (Xie & Kang, 2010) supporting Topf's (2000) suggestion that noise may play a role in staff burnout.

These subjective views are important as hearing becomes pronounced whilst at hospital as the visual environment can be dull, thus making the various sensory stimuli experienced as a hierarchy (Rice, 2003). This uncertainty of sensory aspects governs perceptual outcomes. For instance, when visual uncertainty increases the auditory influence grows (Heron, Whitaker, & McGraw, 2004). As hospital wards have a variety of environment stimuli that is abnormal, sound can bombard patients (Akansel & Kaymakci, 2008). Consequently, the soundscape of a hospital ward may elicit a strong feeling from individuals, which have yet to be fully defined.

1.2. Soundscape

This concentration on sound measurement dismisses sound as simply a negative noise that should be mitigated. Yet the absence of negative sound does not necessarily create a positive environment (Truax, 1984). Indeed, 'quietness' is a hospital environmental quality indicator which is associated with a lack of annoying noises rather than the absence of sound (Fonara et al., 2006). Hospital noise therefore, requires examination of the sources with scope for research into the positive effect of sound (Dawson, 2005). It may not necessarily be the absolute sound level that is important but the content and interpretation.

Little effort to date has assessed sound in terms of perception within hospital spaces and considered sound as the 'soundscape' – the auditory version of the landscape (Schafer, 1976). A soundscape contains keynote sound which distinguish an environment and background ambient sound (Schafer, 1976; Truax, 1984). Unlike acoustics, this approach deals with the transfer of information rather than energy and considers what sound means to the individual (Truax, 1984). For example, the emotional response to a soundscape shows how a person *feels* towards that environment (Cain, Jennings, & Poxon, 2013). The approach has been explored within urban environments by asking how the perception of sound can be used to improve the experience of such towns and cities (Cain et al., 2013; Davies et al., 2013; Yang, 2007). This moves away from sole acoustic analysis thereby building a richer picture of the individuals' response to a space.

1.3. The presented study

As little research considers the soundscape of a hospital ward, this paper begins to tackle this and explores the perception of sound within a cardiothoracic (CT) ward in a UK hospital. The aim of the study was to conceptualise the lived experience of the soundscape from patients and nurses, discovering positive and negative aspects, the influence that sound has, and some of the associated feelings. This work was used to derive further research within this relatively new area to help define what a positive hospital soundscape should provide. To achieve this, the study used in-situ interviews with both clinical nurses and patients.

2. Method

2.1. Research ethics and study setting

National Health Service Research Ethics approval was obtained and a CT ward was chosen as the location of the study. The ward cared for patients who underwent heart surgery meaning diverse range of equipment created a soundscape similar to an ICU but enabled patients to be actively involved in the research process. The ward consisted of a main area where pre and post-operative patients were present and a step down area where patients who were discharged from the ICU initially recover. The study was conducted within both these locations as the step down area contained additional monitor and breathing devices thus creating a slightly different soundscape to that of the main area.

2.2. Interview procedure

Semi-structured interviews were conducted with both patients (P) and nurses (N) on the ward to gather thoughts and perceptions towards the soundscape. An interview schedule was developed which covered topics of the general environment, sound in the environment, and future design. This was tested on a pilot sample of seven healthcare professionals before the main data collection period. From this no modifications to the interview schedule were made but the coding procedure was refined. This helped ensure that the technique was constant across participants and limited variation in procedure, wording, and briefing thus ensuring data quality and reliability (Oppenheim, 1992, p. 148). The pilot participants and results were not used in the presented study.

Interviews ranged from 7 to 19 min in duration. Patients were interviewed at their bedside within patient bay areas. Two of the patients were situated in single rooms off the main corridor. Interviews with nurses were held within an office just off the main corridor. Interviews were started with a prewritten script detailing the aims of the study to maintain consistency between participants. All were recorded on an electronic dictaphone and transcribed verbatim.

2.3. Study sample

A total of 27 participants were interviewed with the sample size dictated by reaching theoretical saturation defined as the point upon which no new properties, dimensions or relationships