Vessel Design and the Well-Being of Seafarers

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Abstract

Human beings now spend more time than ever indoors. However despite this, relatively little is known about the impact of the built environment on health and well-being, especially within the maritime sector. Studies that have been conducted onshore suggest that environmental and architectural features within buildings such as high noise levels, inadequate lighting, and poor quality materials/facilities may all negatively affect the health and well-being of those that live there. Many of these factors are those which a seafarer experiences daily. However, due to the remote and confined location they work within, there is little chance for respite from this environment. This paper reviews studies that have been conducted to date onshore, and looks at the implications they might have for those working at sea. It reflects the early stages of the development of a project which will ultimately consider changes that could be made onboard vessels in order to improve seafarer health and well being.

Introduction

As a consequence of rapid industrialisation in the 20th century and the recent increase in employment in the white collar, service, and retail sectors, human beings now spend the majority of their lives indoors (Zimring, *et al.,* 2005; National Research Council, 1981). Employees spend up to a third of their waking life in an office building (Neuner and Seidel, 2006; Zimring, *et al.,* 2005; Conrad, 1988), and this seems set to rise as average working hours are on the increase, especially in Europe. Not only is much of our working life spent in the indoor environment but, increasingly, so too is much of our home and leisure time (Samet and Spengler, 2003). As a species one might say that we are becoming more and more a "subterranean population".

For those onboard merchant vessels, there is little escape from the built environment, and the modern day seafarer frequently spends the majority of the day, both during work hours and rest periods, inside the structure of the ship, often for months on end. However despite this, relatively little is known about the effects of the built environment on health and well being (Zimring, *et al.*, 2005), especially for those in the maritime environment.

What little is known about the effects of the environment ashore may have important implications for the seafarer, as many of the negative aspects of the physical environment identified onshore can also be seen aboard ship. For example, studies have shown that factors such as quality of housing (Evans, 2003), noise levels (Salyga and Juozulynas, 2006; Riediker and Koren, 2004), light levels (Kuller, *et al.,* 2006), and colour schemes (Caspari, *et al.*, 2006; Baglioni and Capalongo, 2002) may all have effects on health and well-being. Other studies have looked at indirect factors relating to the built environment and their influence on well-being, such as social networks (Hawe & Shiell, 2000; Kawachi, 1999; Kawachi, *et al.*, 1997; Semenza *et al.*, 1996; Berkman, 1995), social support (Evans, 2003) and crowding (Van de Glind, *et al.*, 2007; Caspari, *et al.*, 2006). Similarly there has been research in clinical settings, and the built environment is now increasingly recognised as of relevance to the therapeutic process (Van de Glind, *et al.,* 2007; Caspari, *et al.*, 2006; Tyson, *et al.,* 2002; Gross, *et al.,* 1998). Factors such as aesthetically pleasing environments (Caspari, *et al.*, 2006; Evans, 2003) arrangement of furniture (Evans, 2003), windows (Van de Glind, *et al.,* 2007) light (Baglioni and Capalongo, 2002) and privacy (Nelson, *et al.*, 1998) have all been shown to influence patients well-being and recovery from illness.

Such factors equally impact upon seafarers, particularly as onboard they are effectively institutionalised with little opportunity to get away from the vessel.

Although vessels are built for specific purposes, which inevitably places constraints upon design (Salyga and Juozulynas, 2006), there is scope for some change which could beneficially impact upon seafarers. For example, accommodation and recreational facilities may be redecorated using more aesthetically pleasing colours, or facilities such as barbeques may be provided that encourage social interaction. Such change can play an important role in buffering against the negative impact of the environment of a vessel, and may also help seafarers to relax and restore themselves. Indeed research shows that several properties of the environment may be linked to more or less effective recovery from cognitive fatigue and stress (Maas, *et al.,* 2009; Kaplan, 1995).

Within this paper I will look at the land-based research that has been conducted relating to the built environment and its effect on health and well-being, and I will outline related implications for those who work on marine vessels. The possible impact of these factors will be illustrated, with some recommendations being made as to how accommodation and recreation facilities may be better designed or adapted in order to improve the health and well-being of those onboard.

Defining Health and Well-Being

Although 'health' and 'well-being' are everyday terms, defining them is actually very difficult, as definitions vary greatly depending upon context. In the past health was simply defined as the absence of disease (Emmet, 1991). However, nowadays it is seen as a more encompassing concept, including not only physiological well-being, but also psychological and social health. For example, the World Health Organisation (2009) defines health as, 'a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity' (World Health Organization, 2009). Well-being is generally seen as a more cognitive and subjective concept, and is frequently measured simply by asking individuals about how they feel. For example, Oswald, *et al.*, (1999) suggests that, 'subjective well-being addresses how good an individual feels about his or her life at a given time, and this construct includes cognitive and affective components' (Oswald, *et al.*, 2007, pg 97). These definitions will be used as the basis of how 'health' and 'well-being' are understood within the context of the current paper.

The Direct Influence of the Physical Environment on Health and Well-being

As discussed in the introduction, there have been a number of studies which have looked at the link between the built environment and health and well-being. Although some of the studies onshore were conducted in a clinical setting they, nevertheless, demonstrate the influence of the environment on the individual, and thus may be relevant to discussion of the built environment onboard ship. These factors, as well as

ways in which they may be modified or adapted in order to improve the health and well-being of seafarers will now be discussed.

Noise

An obvious factor that may have an effect on the health and well-being of seafarers, is noise. Ships are renowned for being noisy places, as Salyga and Juozulynas (2006) point out, 'Noise and vibration as well as the continual rolling and pitching of the ship are constant problems' (Salyga and Juozulynas, 2006, pg766). Not only may seafarers have to cope with continuous noise from engine and other machinery, they may also be faced with more distracting unpredictable noises, for example noise associated with cargo operations, or noise from hand tools in the course of routine shipboard maintenance. Although there is little information about the impact of such noise on those that work onboard, the affect of noise on well-being has attracted much attention onshore. For example, Reidiker and Koren (2004) suggest that, 'even at moderate sound levels it can cause serious psychological, social, and bodily effects' (Reidiker and Koren, 2004, pg194). Other studies have reported similar findings. For example, Stansfeld (1993) suggests that environmental noise exposure, i.e. noise from airports, may lead to increased psychological distress.

In the case of seafarers, the negative effects of noise may be exacerbated by the fact that they live where they work, and not only are they exposed to such noise levels at work, but also during rest periods. This is important as noise has been shown to have a negative affect not only on well-being, but also on sleep quality (Riediker and Koren, 2004), which may lead to increased levels of fatigue.

Light Levels

Another factor relating to the built environment that may be of concern for those working at sea is light. The effect of light on mood and well-being are well documented, for example there has been much research into the reduction of light during short days of the year, know as 'Seasonal Affective Disorder (SAD)', which has found that reduced exposure to light may cause depression, increased fatigue, and a lack of energy. For the seafarer, exposure to light will depend greatly on the

department they work within as well as ship type they are serving on. For example, a junior engineer may spend much of his day under artificial light in the engine room. By contrast, an AB may spend much of his day on deck, exposed to natural light. Although the Merchant Shipping (Crew Accommodation) Regulations (1997) state that marine crew accommodation must be adequately lit by natural light, and defines 'adequately lit' as enough light during day time to read a newspaper, simply meeting such predefined standards may not be enough. Research suggests that the affect of light is not straightforward, and that the amount of light required by individuals is variable. For example a study of light and colour in the work environment found that amount of light had a significant impact on mood (Kuller, *et al.* 2006). Mood was happiest when light levels were seen by individuals to be 'just right', but declined if levels were perceived to be too high or too low. Other studies have found comparable results (i.e. Evans, 2003), in relation to daylight. Similar results have also been found in clinical studies. Caspari, *et al.*, (2006) suggest for example that for patients light is important for recovery and rehabilitation, whereas for staff light levels influence health and well being.

Although more research is needed into light levels onboard ship, there may be a number of small changes that may be made in order to maximise the beneficial effects of light. For example fitting 'daylight' bulbs rather than neon strip lights may make the environment more naturalistic and pleasant. Lighting systems in areas such as accommodation and recreation may also be adapted so that they may be adjusted by individuals and set to levels that are seen as appropriate by them, for them.

The View From The 'Window'

Whilst the effects of light and noise on wellbeing are generally fairly well known, one factor that has been found to be linked with health and well-being, which may come as more of a surprise is the provision of, and proximity to, windows. Although on the face of it, this may seem to be associated with light, the relationship is not considered to be so straightforward. Research suggests that the importance of a window relates to the 'view' from it, rather than just the amount of daylight it delivers (Kuller, *et al.,* 2006).

The impact of a view on health and well-being is well documented. A number of studies have found that views of nature can be seen to have positive effects on well-being (Van de Glind, *et al.,* 2007; Evan, 2003). Similarly, the distance an office worker is seated from a window has also been shown to relate to mood (Kuller, *et al.,* 2006). For the seafarer, this paints a poor picture, as it is not uncommon for a seafarer's view from their cabin to be of a stack of containers or machinery on the deck.

Aesthetics

Through research that has been conducted onboard vessels within SIRC it is apparent that an area of the modern ship that often seems to be ignored or overlooked in terms of vessel design and management is that of aesthetics, specifically within accommodation and recreational areas. These areas are frequently furnished with dark colours, with little scope for personalisation, or modification, and colour schemes are often continued throughout the whole vessel, with little distinction between work and rest areas. Although such considerations may not seem important, especially as a vessel is primarily a place of work, studies looking at factors, such as, the colour of walls or the decor have shown that aesthetically pleasing surroundings may have important effects on well-being, mood and behaviour (Kuller, *et al.,* 2006; Caspari, *et al.*, 2006; Baglioni and Capalongo, 2002). For example, Caspari, *et al.*, (2006) in a review of the strategic plans for the aesthetics of hospitals suggest that, 'dark and gloomy colours can lead to an analogue state of mind, whereas gaudy colour can lead to irritability, aggressiveness, increases in blood pressure, and a general feeling of unpleasantness'. More generally they suggest that high quality working conditions reduce stress factors, strengthen immunity, and heighten the contentment factor' (Caspari, *et al.*, 2006, p856-857). Similar results are also found in non-clinical populations. Kuller, *et al.* (2006) found that the use of good colours in the work environment served to improve the mood of staff. Whilst Guite, *et al.* (2006) in a non-clinical population found that poor quality housing was associated with poor mental health.

These studies indicate that the aesthetics of a vessel whilst largely ignored may actually have a real impact on the well-being of those that work onboard. Positive

changes to the aesthetics of the environment may be relatively easily to undertake, for example, accommodation facilities may be refitted using more aesthetically pleasing colours in order to make them more stimulating and inviting areas to live and work in. Efforts may also be made to vary the use of colours so that work areas and accommodation and recreation facilities are visually distinct, re-enforcing the boundaries between work and rest. In relation to the quality of soft furnishings (including carpets and curtains) more attention could usefully be paid to cleanliness and maintenance.

Confinement

Before we look at social factors which are effected by the built environment are a final factor that we will look at, which has attracted much attention in the literature is that of (over) crowding. Research into crowding ashore suggests that it may cause psychological stress (Evans, 2003), and similarly in clinical studies it has been found that crowding is associated with increased anxiety and poor socialisation (Hellman, *et al.*, 1985).

Although crowding per se, may not be a problem for those working at sea, especially in light of the current trend to crew at near minimum levels, ships are confined spaces, and seafarers have little access to open spaces, with few chances to go ashore. The constrained lay out of the vessel also means that they have little private space. Therefore, seafarers may be seen in some respects, which are worthy of further exploration, to experience similar issues to those in crowded buildings.

Indirect Influences of the Physical Environment on Health and Well-being

So far the physical features onboard vessels that may have a direct influence on the health and well-being of those living and working there have been considered. However, it is also interesting to look at the interaction between the built and the social environment onboard. Ships should not simply be seen as geographical areas, they are complex spaces in which people conduct their lives (Neuner and Seidel, 2006; Airey, 2003; Hancock, 2002; Baldry, *et al.*, 1997).

The physical features of the ship environment may indirectly affect health and well-being through their impact on other factors such as socialisation, social support, and restoration (Neuner and Seidel, 2006). It has been argued that 'there is an association between features of the environment and perceptions of neighbourhood social functioning that may indirectly influence health outcomes. Therefore changes in the urban design may influence health and well-being' (Cohen, *et al.*, 2008, p206).

Social Networks

One of the things said to be beneficial to health and well-being and also argued to be effected by the built environment is the capacity for social networks to develop. Cotterell (1996) defines social networks as 'the structures and sets of relations found in an individual's social landscape' (Cotterell, 1996, pg14), and research suggests that there are a number of factors relating to the physical characteristics of the environment that may prohibit or encourage the development of these.

One such factor is the provision of, and access to, public gathering places. This has been shown to facilitate the formation of social networks, which may have a positive impact on mental and physical health (Maas, *et al.*, 2009; Leventhal & Brooks-Gunn, 2003; Hawe & Shiell, 2000; Kawachi, 1999; Dalgard & Tambs, 1997). However, my experience from research onboard suggests that there is often little 'public' or shared space (i.e. recreational spaces) which is not deemed to be a work space. In some cases, even when public or recreational space is available, it is used for other purposes, for example, storage. When there are shared spaces onboard, such as mess rooms, these are often solely available to particular ranks, and thus may not facilitate whole crew interaction. This may not only lead to difficulties in building relationships onboard, but also in some cases isolation (Sampson and Thompson, 2003).

Although it may be challenging to alter the amount, and nature of public space onboard, studies do suggests that interaction within such spaces as are available may be encouraged by the introduction of 'activity generators' such as food (Evans, 2003) and the arrangement of furniture (Tyson, *et al.*, 2002; Baldwin 1985; Melin & Götestam 1981). For example, the provision of barbeque facilities could encourage

crews to get together in order to celebrate national events, or individual milestones, such as birthdays. However, research does suggest that social interaction should not be forced, and that people should be able to decide whether they participate in such activities or not (Evans, 2003). The fact that the mess rooms are often the only public spaces onboard (Sampson and Thompson, 2003) may mean that it may be very difficult for seafarers to choose whether they participate in such activities, especially if they are organised by a senior officer, as there may be seen to be an expectation for all crew to participate.

Social Support

Another social factor argued to be effected by the built environment is that of social support (which is related to social networks). Cohen (2004) defines social support as, 'a social network's provision of psychological and material resources intended to benefit an individual's ability to cope with stress" (Cohen, 2004, pg 676). The possible link between levels of support and health and well-being is well established (see Chan and Lee, 2006; Franzini, *et al.*, 2005; Berkman and Syme, 1979), and research shows that there are a number of factors within the built environment that may influence the amount of support that people provide to one another. For example, although the impact of noise on those onboard vessels has already been discussed in relation to its direct effects, exposure to noise may also indirectly affect health and well-being through its influence in the amounts of social support offered by seafarers to other seafarers. For example, exposure to noise has been shown to interfere with communication and can cause irritability, which subsequently leads to people offering less support (Cohen and Spacapan, 1984).

Onboard there may be a number of situations where noise could be seen to inhibit communication, for example, a noisy engine room or machine space may severely affect the ability of people to communicate with one another. Although it may be argued that such areas are places of work, the benefits of conversation during work can be easily seen: conversation often makes a long and tedious job more tolerable, and allows good and supportive friendships to be established.

For the majority of us social support is usually provided by family members and friends (Chan and Lee, 2006). However, unsurprisingly for those at sea the ability to communicate with those at home is often severely restricted (Sampson and Thompson, 2003; Thomas, *et al.*, 2003). Such communication difficulty is not only due to the physical remoteness of the vessel, facilities such as telephone and internet access are often unavailable or severely restricted onboard. Even when such services are available they are often costly, which may be a particular problem for those is the poorer paid lower ranks.

Restoration

The final issue I am going to consider is 'restoration', and this is probably the most important in terms of those working at sea. Restoration refers the ability to recover from physical demands and psychological stress. Seafarers are often subjected to long hours, irregular shift patterns, and quick turn around times which are suggested to result in high levels of fatigue (Allen, *et al.*, 2005). Thus the ability to recover from such demands quickly, and effectively, may be imperative.

A number physical properties of the environment have been linked to restoration, and recovery from fatigue and stress (Maas, *et al.,* 2009; Kaplan, 1995), as well as physical recovery in a clinical setting (Van de Glind, *et al.*, 2007; Caspari, *et al.*, 2006). Many of these have previously been discussed in relation to direct environmental influences on well-being, for example, exposure to nature has been found to positively relate to recovery from stress and fatigue (Maas, *et al.*, 2009; Kaplan, 1995). Similarly aesthetically pleasing surroundings' have been shown to increase recovery rates from mental fatigue (Evans, 2003). Within a clinical setting light levels have been found to be important in the recovery and rehabilitation of patients following surgery (Caspari, *et al.*, 2006).

Conclusions

Although this paper reflects only the very early stages of the work that is being conducted, it does draw together findings from a wide range of studies onshore that

have looked at how the built environment affects the health and well-being of those residing within it. Although these factors were identified through research onshore, they can be seen to have direct relevance to the seafarer as there are many parallels to the environment onboard ship. Indeed, they may be of greater importance to the seafarer as compared to their onshore counterparts, because for seafarers there is little respite from any negative effects of the environment of the ship.

Although the layout of a vessel is fixed and relatively unchangeable due to the specific function that a vessel performs (Salyga and Juozulynas 2006), there is some scope for modification of the built environment which can be easily, and cheaply, made. For example, looking at easily changeable aspects of the environment, cabins and recreation rooms could be decorated using more positive colours and colour schemes and facilities and furnishings could be kept well maintained. Adjustable (dimmer switch) lighting might be introduced into accommodation areas and 'daylight' bulbs could be utilised in relevant areas of ships. In reference to the social environment onboard, karaoke machines and barbeques might be provided in order to encourage crews to interact more in such shared spaces as are available. Such changes to the physical environment whilst being relatively inexpensive may have positive influences on those that work and live within it.

Such efforts to improve the environment and consequently the health and well-being of the crew, may also have positive financial implications for ship-owners. Whilst modification of the environment may not be expensive, repatriating seafarers due to ill-health may be costly. Ashore it has been argued that "workers experiencing poor health and well-being in the workplace may be less productive, make lower quality decisions, be more prone to be absent from work" (Danna and Griffin 1999, pg 358). There may also be other consequences of ignoring the impact of the built environment. For example, research into restoration suggests that a poor built environment they may drastically reduces seafarers' ability to recover from the demands of their jobs, which may ultimately lead to fatigue. Therefore the design of accommodation and recreational faculties should be seen not just an issue relating to seafarers health, but also one that may indirectly affect ship operators as a result of the impact that such things have on work performance and the related possibility of accidents.

To date research in this area within the maritime industry is very limited, and the review of onshore research presented here only illustrates the possible factors that may be relevant within the maritime industry. This paper presents the beginning of a project and which is being conducted by the Lloyd's Register Educational Trust Research Unit (LRETRU). As the research develops further findings will be made publicly available.

References

Airey, L. (2003) Nae as nice a scheme as it used to be: Lay accounts of neighbourhood incivilities and well-being. *Health Place*, 9(2), 129-37.

Allen, P., Wellens, B., McNamara, R. & Smith, A. (2005) It's not all plain sailing. Port turn-arounds and seafarers' fatigue: *: A case study*. 563-567. *In Contemporary Ergonomics 2005, edited by Bust P.D. & Mcabe P.T.* Taylor & Francis, London.

Baglioni, A., & Capolongo, S. (2002) Ergonomics in planning and reconstruction. *Giornale Italiano Di Medicina Del Lavoro Ed Ergonomia*, 24(4), 405-9.

Baldry, C. (1997) The social construction of office space. *International Labour Review*, 136, 365-374.

Baldwin, S. (1985). Effects of furniture rearrangement on the atmosphere of wards in a maximum-security hospital. *Hospital and Community Psychiatry*, 36, 525–528.

Berkman, L.F. (1995). The role of social relations in health promotion. *Psychosomatic Medicine*, 57, 245-254.

Berkman, L.F., & Syme, L.S. (1979). Social networks, host resistance, and mortality: A nine-year follow-up study of Alameda county residents. *American Journal of Epidemiology*, 109, 186–204.

Caspari S., Eriksson K., & Naden D. (2006) The aesthetic dimension in hospitals - An investigation into strategic plans. *International Journal of Nursing Studies*, 43(7), 851-9.

Chan, Y.K., & Lee, R.P.L. (2006) Network size, social support and happiness in later life: A comparative study of Beijing and Hong Kong. *Journal of Happiness Studies*, 7, 87-112.

Cohen S. & Spacapan S. (1984) *The social psychology of noise*. 221–245. *In Noise and Society, 1984, edited by Jones D.M., & Chapman A.J.* Chichester, England: Wiley.

Cohen, D.A., Inagami S., & Finch B. (2008) The built environment and collective efficacy. *Health and Place*, 14(2),198-208.

Cohen, S. (2004) Social Relationships and Health. *American Psychologist*, 59(8) 676-684.

Conrad, P. (1988) Health and fitness at work: A participants' perspective. *Social Science Medicine*, 26(5), 545–550.

Cotterell, J. (1996) *Social Networks and Social Influences in Adolescence*. Routledge: New York.

Dalgard, O.S., & Tambs, K. (1997) Urban environment and mental health. A longitudinal study. *British Journal of Psychiatry*, 171, 530-536.

Emmet, E.A. (1991) Physical and chemical agents at the workplace. 35–44. *In Work, health, and Productivity, 1991, edited by Green G.M. & Baker F.* New York: Oxford University Press.

Evans, G.W. (2003) The Built Environment and Mental Health. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, 80(4), 536-555

Fleming, R., Baum, A., & Singer, J.E. (1985) Social support and the physical environment. 327–346. *In Social Support and Healt, 1985, edited by Cohen S., & Syme L.* New York: Academic.

Franzini, L., Caughy M., Spears W., & Esquer, M.E.F. (2005) Neighborhood economic conditions, social processes, and self rated health in low-income neighborhoods in Texas: A multilevel latent variables model. *Social Science & Medicine,* 61, 1135–1150.

Freeman H.L. (1984) *Housing*. 197–225. *In: Mental Health and the Environment, 1984, edited by Freeman H.L.* London: Churchill Livingstone.

Gross, R., Sasson, Y., Zarhy, M. & Zohar, J. (1998). Healing environment in psychiatric hospital design. *General Hospital Psychiatry*, *20*, 108–114.

Guite, H.F., Clark, C., & Ackrill, G. (2006) The impact of the physical and urban environment on mental well-being. *Public Health*, 120(12), 1117-26.

Hancock, T. (2002) Indicators of environmental health in the urban setting. *Canadian Journal of Public Health*, 93(l), 45-51.

Hawe, P., & Shiell, A. (2000). Social capital and health promotion: A review. *Social Science and Medicine*, *51*, 871-885.

Hellman, I.D., Greene, L.R., Morrison, T.L. & Abramowitz, S.I. (1985) Organisational size and the perceptions in residential treatment programmes. *American Journal of Community Psychology*, 13, 99-105.

Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology*, *15*(3), 169-182

Kawachi, I. (1999). Social capital and community effects on population and individual health. *Annals of New York Academy of Sciences*, *896*, 120-130.

Kawachi, I., Kennedy, B. P., Lochner, K., & Prothrow-Stith, D. (1997). Social capital, income inequality, and mortality. *American Journal of Public Health*, *87(*9) 1491-1498.

Küller, R., Ballal, S., Laike, T., Mikellides, B., & Tonello, G. (2006) The impact of light and colour on psychological mood: A cross-cultural study of indoor work environments. *Ergonomics*, 49(4) 1496-507.

Leventhal, T., & Brooks-Gunn, J. (2003). Moving to opportunity: An experimental study of neighbourhood effects on mental health. *American Journal of Public Health*, *93*(9), 1576-1582.

Maas, J., Van Dillen, S.M.E., Verheij, R.A., & Groenewegen, P.P. (2009) Social contacts as a possible mechanism behind the relation between green space and health. *Health & Place,* 15, 586–595.

Melin, L. & Götestam, K.G. (1981). The effects of rearranging ward routines on communication and eating. *Journal of Applied Behaviour Analysis*, *14*, 47–51.

Merchant Shipping (Crew Accommodation) Regulations (1997) *Statutory Instrument 1997 No. 1508* [Online]. Available: http://www.opsi.gov.uk/si/si1997/19971508.htm.

National Research Council (1981) *Indoor Air Pollutants.* Washington, DC: National Academy Press.

Nelson, G., Hall, G.B., & Walsh-Bowers, R. (1998) The relationship between housing characteristics, emotional well-being and the personal empowerment of psychiatric consumer/survivors. *Community Mental Health Journal*, 34(1), 57-69.

Neuner, R. & Seidel, H.J. (2006) Adaption of office workers to a new building – Impaired well-being as part of sick building syndrome. *International Journal of Hygiene Environmental Health*, 209(4), 367-375.

Oswald F., Wahl H.W., Schilling O., Nygren C., Fänge A., Sixsmith A., Sixsmith J., Széman Z., Tomsone S., & Iwarsson S. (2007) Relationships between housing and healthy aging in very old age. *Gerontologist*, 47(1), 96-107.

Riediker, M., & Koren H.S. (2004) The importance of environmental exposures to physical, mental and social well-being. *International Journal of Hygiene and Environmental Health*, 207(3), 193-201.

Salyga, J. & Juozulynas, A. (2006) Association between environment and psycho-emotional stress experienced at sea by Lithuanian and Latvian seamen *Medicina (Kaunas)*, 42(9), 759-769.

Samet, J.M., & Spengler, J.D. (2003) Indoor environments and health: moving into the 21st century. *American Journal of Public Health*, 93(9), 1489-93.

Sampson, H., & Thomas, M. (2003) The social isolation of seafarers: causes, effects, and remedies. *International Maritime Health,* 54(1-4), 58-67.

Semenza, J.C., Rubin, C.H., Falter, K.H., Selanikio, J.D., Flanders, W.D., Howe, H.L., & Wilhelm, J.L.. (1996). Heat-related deaths during the July 1995 heat wave in Chicago. *New England Journal of Medicine*, *335(*2), 84-90.

Stansfeld, S.A. (1993) Noise, noise sensitivity, and psychiatric disorder: epidemiological and psychophysiological studies. *Psychological Medicine, Monograph Supplement*, 22, 1–44.

Thomas, M., Sampson, H., & Zhao, M. (2003) Finding a balance: Companies, seafarers and family life. *Maritime Policy and Management*, 30(1), 59-76.

Tyson G.A., Lambert G., & Beattie L. (2002) The impact of ward design on the behaviour, occupational satisfaction and well-being of psychiatric nurses. *International Journal of Mental Health Nursing*, 11(2), 94-102.

Van de Glind, I., De Roode, S., & Goossensen, A. (2007) Do patients in hospitals benefit from single rooms? A literature review. *Health Policy*, 84(2-3),153-61.

World Health Organization (2009) *Definition of Health* [Online]. Available: http://www.who.int/about/definition/en/print.html.

Zimring, C., Joseph, A., Nicoll, G.L., & Tsepas, S. (2005) Influences of building design and site design on physical activity: Research and intervention opportunities. *American Journal of Preventative Medicine*, 28(2),186-93.