Health and wellbeing in design studio briefs– architecture and engineering graduating students' motivations and approaches

Abstract

The purpose of this paper is to reflect upon architecture and environmental engineering students' approaches to health and wellbeing issues in design studio project briefs. The design studio project is a key aspect of the students' fourth year programme in a dual accredited (RIBA/ARB and CIBSE) BEng course in the SW of England. Whilst the overarching site and brief are set by the studio leader, each student develops their own project agenda drawing on extensive urban and site analysis as well as precedent research. Particular detailed aspects of the brief are then further analysed and researched as part of an engineering report study. The research draws on first author's earlier work on effects of non-prescriptive briefs on transdisciplinary studio working (Oliveira and Marco 2016) in architecture and engineering programmes.

Drawing on visual ethnography methods, the preliminary observations drawn out of the study begin to consider key intrinsic / extrinsic motivations and assumptions students draw on to develop a health and wellbeing agenda in their projects and the way these motivations further inform analysis in the engineering reports. The implications of the research are twofold. First, the preliminary analysis enables new insights into assumptions graduating architecture and engineering students draw on to develop a health and wellbeing motivated agenda. Second the study has benefits for design studio education brief setting approaches in particular, increasingly drawn upon in engineering and multidisciplinary built environment pedagogy.

Practical application: This paper enables new initial insights into ways designers (architects and building services engineers) approach health and wellbeing issues at early stages of design, drawing on a higher education empirical setting. It is particularly relevant to professionals as well as educators in the built environment.

Keywords: architecture, brief, design studio, engineering, health, wellbeing

1. Introduction

There has been a recent resurgent interest in understanding buildings' impact on the environment and on the health and wellbeing of their users. WHO defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.[1] The design of buildings can be health promoting, not only in physical environmental terms (light, temperature, ventilation, noise, hazards), but also in terms of access, affordability, adaptability and sustainability.[2]

Emphasis in construction policy and practice in the UK has been largely focused on measuring outcomes and impact[3,4] as well as providing guidance on design criteria and interventions that promote health.[5] Growing development of certification routes for buildings which are specific to health and wellbeing such as the WELL standard for instance, promote an approach that goes beyond the environmental design focus familiar in assessment models such as BREEAM.[6] Much work on health and wellbeing in the built environment is largely focussed on the office environment and the potential for improved productivity. An environment which improves wellbeing is suggested to enable improved productivity of 2-3% and is seen to be

the equivalent to offsetting 30-75% of office rental costs depending on location in the UK.[7] The renewed focus on wellbeing in the workplace is supported by a number of research studies conducted by the BCO, advocating inclusion of design criteria linked to enabling or sustaining health and wellbeing.[7,8]

Outside the workplace setting, research across building science, environmental psychology, design, architecture, and public health (among others) suggest a wide range of building interventions can help support human health and well-being in a range of building types and settings.[9,10] There also exists a large body of evidence that points to the role of the designed environment in users' health and wellbeing including: floor layouts, noise levels, lighting, single rooms, ventilation, exposure to daylight, access to green environments, proximity to windows and health outcomes.[11,12,13,14] Furthermore, improvements in the built environment are suggested to have led to key advances in public health[15], for instance in addressing health inequalities.[16]

Mitigating climate change and reducing energy use has also been a key driver for most policies, with health and wellbeing viewed as an outcome of the intervention. Increasingly, improving health and wellbeing is shifting towards the creation of healthier environments, having historically been centred on improving health care systems.[5] The ability of building design to contribute to the health and well-being of users has been well documented. [11,17,18] A healthy building is defined as 'built environment that encourages positive well-being of human beings'.[19] It has been argued that the majority of the impact of a building on the health and wellbeing of its users is determined in the early stages of its design.[20] Efforts are being made for instance in the case of Public Health UK to reconnect built environment with public health professionals to ensure health aspirations are considered early in building design stages.[21]

To date though, despite the widely recognised significance, with some few notable exceptions[22,23], there are limited empirical studies that explore how designers including practicing architects and engineers develop initial thinking on wellbeing and health in the early stages of design. There are also limited accounts in higher education. Most research in architecture and engineering higher education has focused largely on advocating for a greater inclusion of health criteria in design studio briefs.[9,10] Despite the recognised significance of understanding early design processes in both practice and education settings, there is little or no exploration into designers' assumptions or motivations that shape initial approaches to health and wellbeing in building design.

The purpose of this paper is to explore graduating architecture and environmental engineering students' assumptions and motivations to health and wellbeing in early design brief development stages. The following sections review literature on health and wellbeing in architects' and engineers' design practice followed by a discussion on motivation theory that underpins the data analysis. This is followed by a discussion of preliminary observations and key themes as well as a discussion of implications and contribution of the research.

Assumptions and motivations – the design brief effects

The design brief is viewed as a central decision-making document in building design and construction.[24] It is acknowledged that design responses developed in the initial briefing stages of a project can have significant impacts on the health and wellbeing of occupants in buildings, though empirical accounts are limited to date. Elf et al.,[25] carried out research in Sweden to understand the ways designers responded and interpreted twenty nine design briefs with regards to users' health needs in new and retrofitted buildings. Their study found that most briefs did not articulate clearly the user health needs, thereby having a significant

impact on the design response undertaken by the designers as well as the quality of the building and users' health. They found that eleven of the briefs did not include sufficient description of the healthcare activities that were taken place and largely did not distinguish between patient' and healthcare provider' needs. None of the briefs contained information that clearly referred to the indicators of good quality in healthcare. The descriptions of the perspectives of the patients and healthcare personnel were rather similar, although the briefs tended to provide more detailed information about the needs of the healthcare personnel than the needs of the patients.

Rehn and Schuster[26] suggest that architects' approaches to design briefs for key building features such as the lobby and patient rooms in a health facility can have a significant effect to patients' behaviour. They studied the effects of renovated aspects of a building such as a lobby and patient rooms on 851 patients' experience and expectations before and after the renovation. It was noted that patients reported the clinic to be more effective after renovations had taken place, with the design of the lobby in particular having an effect on 'health behavioural intentions'. They suggest that approaches to health in early design stages can influence 'factors that are not directly linked to the healing process but have some impact on it'.[26] Whilst the focus of their study was on designers' approaches to designing particular building features, they highlight the important effects design assumptions can have on perceptions of wellbeing and health in the building as a whole. Rehn and Schuster[26] highlight the importance of understanding the effects designers' assumptions can have on the ways health is designed for, however, their study does not discuss what these assumptions might be or where they derive from. Van der Linden et al.,[27] suggest that designers including architects tend not to rely on scientific evidence, regulations or guidance necessarily when designing. It is suggested that architects and engineers design primarily for either their peers[28] or themselves.[29] Whilst there are no accounts of how practicing designers (architects and engineers) or students consider health in buildings more generally and what assumptions they draw on to develop a design response to health needs, there have been studies on architects' consideration for health in therapeutic environments.

Van der Linden et al.,[27] examine meanings associated with healing amongst five designers involved in the delivery of Maggies' centres. Designers were encouraged to 'tell their story' in order to understand how the concept and meanings associated with healing evolved during design. Their findings suggest architects tended to focus primarily on spatial experiences and conceptions of nature derived from personal experiences in order to respond to users' emotional needs. Van der Linden et al.,[30] similarly discuss designers' implicit response to developing design briefs in a study of three architecture firms. Their study offers insights into the importance meanings and perceptions of how a space may be used and by whom are deeply implicit and 'person-bound' in architecture.

The above discussion offers helpful insights into the effects of early design considerations on both perceptions of health and health outcomes of users in buildings. The discussions also begin to suggest the importance of understanding the assumptions and motivations that underlie design decisions. The following section describes the analytical benefits of a theoretical framework concerned with understanding drivers and influences behind human actions.

Motivation Theory

In seeking to understand the drivers and influences behind human actions, a range of different theoretical frameworks have been developed, centred around the concept of motivations.[31,32,33] Theories of motivation have emerged as an important phenomena for

persons or organisations seeking to educate, inform or change human behaviours. These theoretical frameworks assist in analysing and evaluating how and why individuals are driven towards action as well as the nature of individuals' actions over a sustained period of time.[33]

Classic conceptualisations categorise motivations as either intrinsic and extrinsic.[31] Intrinsic motivation is defined as a desire to act because a task or action is in itself rewarding. Intrinsic motivation comes from within the individual and relates to an internal desire for personal development, such as, building competencies, expanding knowledge, or achieving autonomy.[31] Conversely, extrinsic motivations are borne of external influences. Unlike intrinsic motivation, extrinsic motivation comes from an external source and is commonly understood to be orientated towards some form of personal gain rather than personal enjoyment or betterment. Ryan and Deci[31] describe how extrinsic motivation exists when an "activity is done in order to attain some separable outcome". In classic readings, extrinsic motivation is presented as undesirable or objectionable, especially in comparison to intrinsically motivated actions. However, more contemporary theories of motivations, specifically self- determination theory (SDT) develop more nuanced readings of multiple types of extrinsic motivations. In addition to the less favourable drive of personal gain, self-determination theorists suggest factors such as value systems, a sense of morality, learned norms of right and wrong may also be considered as extrinsic motivations for action. Moreover, SDT proposes that humans may possess a spectrum of motivations and that these may also change over time, including from an extrinsic form to an internalised or autonomous form.

The spectrum of motivations that humans experience is an important consideration in relation to education and learning, and with specific regard to this study, the way educators embed health and wellbeing principles into design studio pedagogy. Understanding that the same outcome, action or behaviour may be prompted by different motivations[33], and that this motivation might become more intrinsic over time, should inform the approach educators take when seeking to build concern for factors such as the social or environmental success into students' design practices. Qualitative approaches, such as interviews and focus groups, are well suited to researching motivations. Understanding why people are driven to complete actions or tasks may be better understood through conversation. Additionally, longitudinal studies enable research to examine whether motivations are susceptible to change over time and if changes may be orientated towards social or environmental good.

2. Methods

Empirical context: The design studio within BEng Architecture and Environmental Engineering (AEE)

The course is designed to meet Architecture degree Part 1 (RIBA/ARB) and Engineering level requirements (CIBSE). The course structure provides a novel and provocative set of resources through which a new generation of pioneering graduates are able to develop. This unique mix of creativity and analytical enquiry at the centre of the AEE course challenges conventional models, allowing students the opportunity to understand and develop advanced design methodologies whilst acquiring expertise on how they are augmented and resolved through engineering knowledge. Student experience and teaching delivery is centred on a combination of the design studio model that underpins architecture teaching with problem-based engineering learning excellence. Design studio-based education underpins architecture teaching and learning, viewed by Schon[34] as 'reflection in action'. The curricular structure of

design studio is suggested to enable a 'socially active environment of experimentation and collaboration' between students.

Design studio 4 is the final studio module in the sequence of four design project modules that lie at the heart of the BEng (hons) Architecture and Environmental Engineering (AEE) Course. It gives students the opportunity to synthesise, experiment and apply skills they have learnt in the AEE course so far through one critically reflective design project. The studio brief developed by the studio team investigates the developing agenda on **REPAIR** at diverse scales through a deep and critical understanding of the city, the street, the body, the building, the object and broader social, cultural and environmental context. The year also aims to empower students to become critically reflective and to develop particular positions to environmental change and the associated environmental and social problems. Students are encouraged to explore design ideas and investigate solutions through a range of media including physical model making, screen printing, experiential drawing, monitoring and testing, evaluating results through a range of analytical methods simulation, visual analysis and mapping.

As part of the sequence of design modules in the programme, this module aims to continue giving students the opportunity to become critically reflective and to develop their personal stance within the field of architecture and environmental engineering. It also gives the opportunity to develop a view on the application of the principles of sustainability across a social, economic and environmental framework, and to equip students with the skills and knowledge required to work professionally within the built environment. The module assessment is structured in three parts: architecture portfolio, engineering portfolio and an engineering technical research project.

The site (see Figure 1) is located on the intersection of Old Market and Trinity street in the Old Market quarter to the east of Bristol city centre. Dating back almost 900 years to Norman times, the Old Market Quarter's role as the City's main market and primary eastern access means it has played a strong part in shaping this area of Bristol. As recently as the beginning of World War II the whole area was covered in densely populated streets that supported a diverse mixture of homes, workplaces, public houses, theatres, breweries, foundries and many other enterprises. Old Market Quarter suffered as a result of the severance caused by major roads, particularly the destruction of Castle Street together with the building of Temple Way Underpass.

<<Insert Figure 1 here>>

The first part of the project involved students working in groups to investigate the city and site. Each group was asked to contribute and investigate (and analyse that investigation) a particular part of the city fabric drawing on historical, climatic, social, environmental, health and physical data. Those studies were compiled into a source book for all to use. Students participated in discussions considering new live-work spaces in the context of 'repair'. The research of precedent studies as well as in depth analysis of the social, economic and environmental aspects of the city and site were a critical part of this exercise. Within allocated groups the next stage involved creating neighbourhood master plans of the site. From that framework each individual student proposed a suitable programme within the site (and not necessarily in that order). Whilst it was required that students analyse health provision and

issues on the site as well as consider with great care and analysis the health outcomes of their design responses, there was no particular explicit requirement to develop a healthcare facility within individual briefs.

Data collection

The first stage of data collection involved observing day-to day practices of students and how designs evolved over time including discussions in group and individual tutorials, interim and final reviews as well as additional 'ad hoc' discussions. This was conducted by the first author. In all discussions, focus was placed on students account of what mattered in their design in terms of health as well as how this was represented through diagrams, photos, models or drawings. Ethnographic and case study research facilitates a holistic, contextual understanding through incorporating multiple methods of data collection[34], in this case, observations, documentary analysis and interviews. In total 176 hours of observation was completed.

The second stage of data collection involved focus groups with 14 students (out of a total of 15 who were contacted) conducted in small groups of 2-3 students conducted by first author as well as individual discussions conducted by the second author. The study employed purposeful sampling defined as a type of sampling in which, "particular settings, persons, or events are deliberately selected for the important information they can provide that cannot be gotten as well from other choices".[35] Focus groups were carried out with students in order to help generate collective as well as individual views.[36] The interdisciplinary research team met as a group to review the coding process. Architecture, Building services engineering and Environmental Science and health were represented on the research team. The team also conducted analysis of documentary sources including student project outputs; engineering reports, engineering portfolios, architecture portfolios and design statements.

The discussion in focus groups was centred on understanding: 1) the extent to which health and wellbeing issues shaped students' design briefs; 2) what informed the ideas on the need for health and wellbeing the most; 3) what sources informed approach to spaces in terms of health.

Data analysis

The data was collated into a data bank and analysed in NVivo initially using descriptive themes[37]. Thematic coding moves beyond explicit words or phrases and focuses on identifying and describing both implicit and explicit ideas within the data. Codes were then developed to represent identified themes. A theme captures something important about the data in relation to the research question and represents some level of patterned reasoning within the data set[35]. Descriptive codes are valuable in getting the analysis started as well as summarising segments of the data. An analytic code pulls together material into smaller higher-level units.

This descriptive coding resulted in an initial understanding of how health and wellbeing related content was described by students. The second stage of analysis focused on exploring themes in relation to literature on motivation theory and in particular categories of: competence and autonomy.

3. Preliminary Findings

Findings are discussed under the key preliminary themes that emerged from the discussions. Table 1 indicates key themes and subthemes that are then further discussed in section below.

<<Insert Table 1 here>>

Extent to which health and wellbeing shaped the brief

When participants were asked to reflect upon the extent to which health and wellbeing informed their design briefs, most participants noted this to be a key design driver. For many, the focus on health was driven by a need to help the local community by providing facilities that had been taken away or were needed. Participant 2 discusses her approach to the design brief as being driven primarily by the loss of a key community health centre provision.

> "Initially it was about the fact that the last rehabilitation place for men in Bristol shut down and there was a big protest about it; so, there was a need for it"… Participant 2

Participant 1 discusses his design brief being primarily informed by a need to help the local community. The building is seen to need to 'uplift' people and the local area.

> "Mine is all about health and wellbeing; it's about helping people; mine particular importance was biophilia- so the activities that were in the space were all there to help health and wellbeing (Participant 1); the building itself is meant to be uplifting…"

For some participants, a wider Bristol health need informed the design brief, much more so than local needs only. Participant 3 discusses the lack of sports provision for the disabled population in Bristol, seeing his design brief as a possible solution to a wider health need.

> "Part of it was introducing Bristol's disabled population to group activities; there is also individual there as well"…Participant 3

Participant 4 discusses her design brief drivers as being driven by a personal approach to design, not referring to the site itself.
> "…For me it was a key drive; I think just whenever I was doing any part of design, I was trying to think how I can make this space beneficial for health; it was always going back to health"…Participant 4

For many, the master planning exercise determined an overarching approach to health for the site. Figure 2 shows the conceptual approach that was taken to try to reflect a health agenda on the wider site taking into consideration the environmental and social constraints.

> "…We focused on reconnecting the body and strengthening the mind across the site. We wanted to reconnect the body with healthy food, nature and with peace and then strengthen the mind in order to have a more positive outlook about themselves as well as the world around them. The site was divided into two, the North side being dedicated

towards strengthening the mind and the South side dedicated to reconnecting the body…Participant 4"

<<Insert Figure 2 here>>

Overall participants discussed initial ideas for health as either being driven by the perceived local community or wider Bristol city needs as well as a personal design agenda. For some the site masterplanning exercise determined a conceptual approach to health driven by the environmental and social constraints of the site denoting an extrinsic motivation; however the determinants for a 'healthy' design brief were then maintained throughout the design process by an individually driven agenda- denoting the strength of intrinsic motivation to enabling a brief agenda to be held within a changing design process.

What informed the need for health and wellbeing? Site analysis and personal experiences

For most participants, the initial site and urban analysis undertaken in groups enabled an initial insight into the key needs and challenges- both environmental and social. For many health and wellbeing became a key driver as the analysis revealed a local community and wider need for addressing specific health issues including addiction, depression and anxiety. A mapping exercise to determine the types and extent of health provision in central Bristol also provided a snapshot into types of health needs that were not being catered for (see Figure 3).

<<Insert Figure 3 here>>

Participant 1 suggests the site analysis and urban research undertaken by his group gave an initial impression into the site problems and provided scope for the design brief.

> "…The site analysis; looking at the research I had to do for the site analysis was health; It seems that people were generally quite healthy but didn't deem themselves healthy; so it was the way that local people felt about themselves was the driver…"(Participant 1)

Similarly, Participant 4 reflects upon her first impressions of the site issues discovered during the initial site and research analysis.

"…When I started researching addiction, I started reading about the sense of belonging and having people feeling at home in their spaces…From the site analysis the biggest thing that came about was the health analysis so it seemed an important area to address; I started looking at how people can not feel unwanted in these spaces; so I started looking at the book you suggested by David Gissen"… Participant 4

Participant 5 suggests his first 'reading' of the site provided a lens into 'how bad mental health and wellbeing in the area was'. This initial reading of the site provided the impetus to 'start reading into research of how architecture can inform people's mood'.

Whilst the site analysis and facts of the site, provided an initial snapshot into the site problems, for many the health agenda was informed by personal experiences and beliefs. Participant 1 discusses his perceptions of how most health facilities he visited in his life appeared 'closed' and uninviting. This personal experience of health informed his approach to the building design the most.

"…Activities that happen in my building seemed (in other health facilities I visited) to be behind closed doors; didn't seem very accessible; I'd like my building to be a main building- it's not a space behind; its open…The building should be a continuous cycle of prevention and rehabilitation; people will access the services via different routes" Participant 1 (See also Figure 4)

<<Insert Figure 4 here>>

Another participant reflected about his own experience of playing sports and suggested his design brief was primarily driven by his experiences of 'using ill designed sports facilities'. He discusses his approach to being generous with space and enabling different types of activities to be easily accessed throughout the building.

"…Obviously I'm a very sporty person and that drove my design; first-hand experience backed up…one big thing is changing rooms- the ones I had been in are very bad; I've been a bit more generous with them and keeping separation between the changing rooms…" Participant 3

Participant 4 describes the approach to developing the brief 'sense of belonging' as derived from the initial masterplanning approach to the 'inner and outer self'. For her it was 'very important that the occupants of the health centre (she was designing) had a sense of belonging to that place'. She discussed how this would:

"**…**help them build relationships, intimacy and familiarity of the place, which in turn will allow them to be comfortable in this space and be much more responsive to the therapy taking place. It's also important to ensure they have control and ownership of this centre; this is as much their place as it is to the employers." See also Figure 5.

<<Insert Figure 5 here>>

What sources informed design for health; Feel and Facts

When discussing how participants developed knowledge on a particular type of health need in their brief, most reflected upon 'the feel of a space' based on prior experience or other examples. In some instances, the discussions were 'backed up' by facts and statistics.

Examples of similar building uses featured in most reflections of 'where one gets information'. Participant 2 discusses 'getting a feel for the building'.

'I was trying to get a feel for the building based on other examples" Participant 2

For some drawing on examples was experiential. Participant 5 discussed her experience of screen printing as a way of understanding how others might react to a 'new learning experience'. (See Figure 6)

<<Insert Figure 6 here>>

"…I wanted to explore the potential barriers that may occur when introducing this process to inexperienced and hesitant individuals. The intension is to provide a suitable activity that is not intimidating in the first instant but gives individuals the opportunity to explore and develop their skills at their own pace. From my experience screen printing can be enjoyable even at the most basic level. As your confidence grows and skills improve the you can go on to master more complex aspects of printing"…Participant 5

The exploration of stages of screen printing in this instance, was then perceived by the participant to enable a feel for what the different types of spaces needed to feel like (see Figure 7).

<<Insert Figure 7 here>>

One of the participants described how their design was primarily informed and 'validated' by their analysis in the engineering report. Whilst natural ventilation was a key approach in the building, it was particularly hard to achieve and justify in a sports hall environment. The participant described their analysis as informing the potential ventilation options for their sports hall design that would promote health and wellbeing as tested through four scenarios (see Figures 8 and 9).

<<Insert Figures 8 and 9 here>>

4. Discussion and conclusion

The preliminary findings suggest participants' approaches to health are driven by individual, site and city-wide perceived agendas on health. Whilst research suggests that designers tend to draw on personal beliefs and values to develop initial design approaches (Van der Linden et al., 2016) and thereby driven primarily an intrinsic motivation, the study reported in this paper suggests that extrinsic motivation tends to enable an initial approach whilst intrinsic motivation strengthens and shapes the approach further. Most participants suggested that the analysis of the site, local community needs and environmental constraints developed an initial interest in a health agenda. For some the health agenda was about addressing very local issues particular to the local population, such as issues with addiction and depression, whilst for others the drivers were city wide.

In most instances, participants developed the design brief health agenda further by drawing on personal experience, perceptions and feel for ways spaces should look and function based on individual recollections of what a 'sports hall' or 'health centre' or similar 'felt like'. Whether past experiences encountered meant that spaces were ill considered, tight, closed and dark also played a large part in the types of issues participants focused on including visibility, inclusivity and daylight. These personal recollections in some ways 'kept the agenda' going through the numerous design changes and challenges in developing the building. In addition, though not elaborated in this study, most participants reflected upon the usefulness of their engineering knowledge to quickly and effectively test the appropriateness of different 'health' options. For instance, one student considered different ventilation options for his sports hall, selecting a 'naturally ventilated option' after careful analysis.

Whilst policy and practice continue to develop measures and assessment models to assess a building's impact on the health and wellbeing of its users and surroundings, greater efforts are needed to better understand the meanings and associations to health, designers have in the initial stages of design, particularly in education settings. This study begins to shed light on the importance of better understanding the motivations that underlie the initial design approach. These are both extrinsic and intrinsic, rather than one or other. Future studies could consider comparative studies of more than one studio as well as comparative studies between practice and education settings. Most studies on designers approaches to health have also tended to focus on healthcare typologies.

Whilst students were asked to analyse health conditions within the context of their site including health provision, challenges and outcomes, their approach to develop a health agenda was derived from individual perspectives and experiences. This initial motivation to pursue a health brief emphasizes the significance and importance design studio briefs developed by studio leaders play in highlighting issues that otherwise may not be fully considered. Many students highlighted that for instance, the site analysis (themes of which were provided by the studio leader) enabled an initial understanding of the health issues on the site and motivated a design brief health agenda.

This study may therefore assist and support design studio leaders of both architecture and engineering courses to consider how 'health' and 'wellbeing 'are included within the module project briefs. In the instance of this study, whilst students were asked to consider health requirements and needs within the site and their building design in broad terms, there was no explicit set criteria for how these needs would be interpreted. A further study may examine the effects of an explicit brief that states specific health criteria that need to be met. The study also has implications for the respective professional bodies in ways they may consider accreditation and validation criteria to enable a greater consideration of health and wellbeing within architecture and engineering higher education.

References

1. WHO, *Charter of the World Health Organization*, (1946)., WHO, Geneva.
2. Public Health England. *Spatial Planning for Health An evidence resource for planning and designing healthier places.* London: Public Health England, (2017)
3. Ghaffarianhoseini, A., AlWaer, H., Omrany, H., Ghaffarianhoseini, A., Alalouch, C., Clements-Croome, D., & Tookey, J., Sick building syndrome: are we doing enough? *Architectural Science Review*, (2018), *61*(3), 99-121.
4. Gens, A., Hurley, J. F., Tuomisto, J. T., & Friedrich, R., Health impacts due to personal exposure to fine particles caused by insulation of residential buildings in Europe. *Atmospheric Environment*, *84*, 213-221.
5. Bluyssen, P. M., Towards new methods and ways to create healthy and comfortable buildings. *Building and environment*, (2010), *45*(4), 808-818.
6. Young, L., The Well Building Standard: getting the measure of health and productivity. *CIBSE Journal.* https://www.cibsejournal.com/general/the-well-building-standard-getting-the-measure-of-health-and-productivity/ (2016, accessed 5th July 2019)
7. Gupta, R., O'Brien, J., Howard, A. and Cudmore, T., Improving Productivity in the Workplace, *BCO, (2018)*
8. Garrod, E., Pack, J., Poole, W., Wellness Matters, *BCO,* (2018)
9. Pilkington, P., Marco, E., Grant, M. and Orme, J., Engaging a wider public health workforce for the future: a public health practitioner in residence approach to Public Health. *Public Health*, (2013), 127 (5). pp. 427-434. ISSN 0033-3506
10. Grant, M., Marco, E., Pilkington, P., Orme, J. and Burgess, S., The public health residency: A novel way to focus attention on sustainability and wellbeing in the architectural studio. *Journal for Education in the Built Environment,* (2012), 7 (2). pp. 84-109.
11. Ulrich, R., View through a window may influence recovery. *Science*, (1984), *224*(4647), 224-225.
USGBC, LEED Reference Guide for Green Building Design and Construction v4. Washington DC: *U.S. Green Building Council*, (2013)
12. Lawson, B., Phiri, M., & Wells-Thorpe, J., *The architectural healthcare environment and its effects on patient health outcomes: a report on a NHS estates funded research project*, (2003)
13. Douglas, C. H., & Douglas, M. R., Patient-centred improvements in health-care built environments: perspectives and design indicators. *Health expectations*, (2005), *8*(3), 264-276.
14. Daykin, N., Byrne, E., Soteriou, T., & O'Connor, S., The impact of art, design and environment in mental healthcare: a systematic review of the literature. *Journal of the Royal Society for the Promotion of Health*, (2008), *128*(2), 85-94.
15. Ashton, J., & Seymour, H., *The new public health* (Vol. 1). Milton Keynes: Open University Press., (1988)
16. Marmot M. *Marmot Review: Fair Society, Healthy Lives: Strategic Review of Health Inequalities in England*, London: Marmot Review; (2010).

17. Pattanayak, S. K., & Haines, A. (2017). Implementation of policies to protect planetary health. *The lancet planetary health*, (2017), *1*(7), e255-e256.

18. Craig, J. M., & Prescott, S. L., Planning ahead: the mental health value of natural environments. *The Lancet Planetary Health*, (2017), *1*(4), e128-e129.

19. Ho, D. C., Leung, H. F., Wong, S. K., Cheung, A. K. C., Lau, S. S. Y., Wong, W. S., ... & Chau, K. W., Assessing the health and hygiene performance of apartment buildings. *Facilities*, (2004), *22*(3/4), 58-69.

20. Halliday, S., *Green guide to the Architect's job book*. RIBA Publications Limited, (2007)

21. Barton, H., Land use planning and health and well-being. *Land use policy*, (2009), *26*, S115-S123.

22. Gieryn, T. F. (2002). What buildings do. *Theory and society*,(2014), *31*(1), 35-74.

23. Yaneva, A. (2009). *Made by the Office for Metropolitan Architecture: an ethnography of design*. 010 Publishers.

24. Barrett, P., & Baldry, D., Total facilities management towards best practice. *Malden: Blackwell Science Inc.*, (2003)

25. Elf, M., Svedbo Engström, M., & Wijk, H., An assessment of briefs used for designing healthcare environments: a survey in Sweden. *Construction Management and Economics*, (2012), *30*(10), 835-844

26. Rehn, J., & Schuster, K., Clinic Design as Placebo—Using Design to Promote Healing and Support Treatments. *Behavioral Sciences*,(2017), *7*(4), 77.

27. Van der Linden, V., Dong, H., & Heylighen, A., Capturing architects' designerly ways of knowing about users: Exploring an ethnographic research approach, (2016), *Proceedings of DRS*.

28. Kostof, Spiro, The design of cities, *Places* 5, (1989), no. 4: 85-88.

29. Imrie, R., Architects' conceptions of the human body. *Environment and Planning D: Society and Space*, (2003), *21*(1), 47-65.

30. Van der Linden, V., Annemans, M., & Heylighen, A., You'd Want an Energy from a Building": User Experience of Healing Environment in a Maggie's Cancer Caring Centre, (2015) In *Proceedings of the Third European Conference on Design4Health 2015* (pp. 1-9).

31. Ryan, R. M., & Deci, E. L., Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary educational psychology*, (2000) *25*(1), 54-67.

32. Sansone, C., & Harackiewicz, J. M. (Eds.). *Intrinsic and extrinsic motivation: The search for optimal motivation and performance*, Elsevier, (2000).

33. Weiner, B., Human motivation: Metaphors, theories, and research (2 ed.)., (1992) London: Sage.

34. Schön DA. The reflective practitioner: How professionals think in action. Routledge; 2017 Mar 2.

35. Yin, R. K., *Designing case studies*. In Maruster, L and Gijsenberg, M., Qualitative Research Methods, Sage, (2003)

36. Silverman, D. (Ed.)., *Qualitative research*, (2016), Sage.

37. Buchanan, D., & Bryman, A. (Eds.)., *The Sage handbook of organizational research methods*. Sage Publications Ltd., (2009)