



## **Health & wellbeing in offices - A study of literature on the Nordic perspective**

Downloaded from: <https://research.chalmers.se>, 2024-07-24 16:32 UTC

Citation for the original published paper (version of record):

Forooraghi, M., Wallbaum, H., Ryd, N. (2019). Health & wellbeing in offices - A study of literature on the Nordic perspective. IOP Conference Series: Earth and Environmental Science, 297.  
<http://dx.doi.org/10.1088/1755-1315/297/1/012013>

N.B. When citing this work, cite the original published paper.

PAPER • OPEN ACCESS

## Health & wellbeing in offices - A study of literature on the Nordic perspective

To cite this article: Melina Forooragehi *et al* 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **297** 012013

View the [article online](#) for updates and enhancements.



**IOP | ebooks™**

Bringing you innovative digital publishing with leading voices to create your essential collection of books in STEM research.

Start exploring the collection - download the first chapter of every title for free.

# Health & wellbeing in offices - A study of literature on the Nordic perspective

Melina Forooraghi, Holger Wallbaum, Nina Ryd

[melinaf@chalmers.se](mailto:melinaf@chalmers.se),

[holger.wallbaum@chalmers.se](mailto:holger.wallbaum@chalmers.se)

[nina.ryd@chalmers.se](mailto:nina.ryd@chalmers.se)

melinaf@chalmers.se

**Abstract.** **Aim:** This review aims to explore the relation between the physical office environment and employee health as found in the Nordic literature. **Background:** The Nordic countries have a worldwide fame for their high living and working standards. Nevertheless, they have also been facing global challenges related to demographic changes, aging population, and a rise in long term conditions which require a creative way of thinking, and innovative approaches in the ways we deliver buildings and the built environment. The built environment is a health determinant and a resource for health and wellbeing of building users. In office sector, however, there is little known regarding the design implications of the physical environment for health outcomes. A review of the literature on the current state of the art in the Nordic context could offer an opportunity to rethink office design and support dialogue on how better design can improve employee health outcomes. **Methods:** An explorative document analysis of recent literature on workplace environment in the Nordic context was carried out. **Results:** Three main gaps in the literature were identified, including (1) limited understanding of health, (2) unrecognised role of the physical work environment and design professions in relation to health, and (3) diverse research orientations. The combination of results suggests the paucity of the studies relating the physical office environment to positive health approaches. **Conclusions:** This review highlights the need for more quantitative and qualitative methods to give relevant knowledge for complex questions regarding the physical office environment and health outcomes of employees. Future research should enable dialogue and collaboration between different actors such as managers, human resources, occupational health professionals and designers, which can benefit the users of office building.

**Keywords:** Built Environment, Health, Nordic, Office Design, Workplace, Wellbeing

## 1. Introduction

The Nordic countries have a worldwide fame for their high living and working standards. These countries are often at the top of global wellbeing and quality-of-life-related comparisons [1]. Several health outcomes, like long life expectancy and low child mortality rank among the best in the world [2, 3]. Nevertheless, there is no certainty that these countries will maintain their good rankings. Like



all other countries, the Nordics have also been facing global challenges related to demographic changes, aging population, and a rise in long term conditions. These challenges require a creative way of thinking, and innovative approaches in the ways we deliver buildings and the built environment.

Most people spend 90% of their lives within buildings [4]. Everything from light [5, 6], noise levels [7-9], ventilation [10, 11], temperature [12], layout [13, 14], and colour [15-19] affect the daily health of occupants, all of which are influenced and shaped by the built environment. As a result, the workplace plays a key role in employees' health as a place where they spend almost 40% of their waking hours [20].

In the field of workplace environment, most of the research focuses on 'Psychosocial' environments. This refers to various factors, such as social relationship at work and organizational factors. These factors in turn can affect general health and sick leave [21], stress related ill health [22], depression and anxiety [23]. While healthcare building design has long dealt with the built environment and its health-related outcomes, the relationship between physical work environment and employees' health and wellbeing has gained interest only through recent years [24, 25].

Over the past decades, several topics have been brought up in studies concerning physical office environment and employee health and wellbeing. A great number has focused on ambient factors, such as air quality, light and noise [26-28]. Others studied the impact of office type on health-related outcomes [24, 25]. Several factors are associated with the layout of the office. For example, privacy can affect employee wellbeing and job satisfaction [29, 30]. Sense of control over physical work environment is also of importance and has positive effects on employees' satisfaction and wellbeing [31, 32]. Office layout can encourage physical activity as well. There is a relatively new but growing body of research that deals with design features which stimulate movement in the building. As a result, Active Building Design has been developed which promotes access to facilities and services such as height adjustable desks, gyms, bicycle parking and green space. Nevertheless, much of the research in this area has focused on stairs and elevator i.e. [33-35]. Besides the effects of the built solutions, others focused on the design process of offices in relation to employee health and wellbeing. For example, studies highlight that the participation of employees in planning and design processes increases sense of control over the work environment [4] and wellbeing among employees [36].

Employees are the most valuable resource for organizations. Their costs, such as salaries, benefits, but also sick leave accounts for 90% of business expenses [37]. As employee health and satisfaction relates to productivity, and sick leave, their health and wellbeing can have significant financial implications. This equation has made it imperative for many organizations to understand productivity loss and negative health outcomes in relation to the design of workspaces. However, the research is limited, and there is little known about design implication of the physical environment for health outcomes. A review of the literature on the current state of the art in the Nordic context could offer an opportunity to rethink office design and support dialogue on how better design can improve employee health outcome. Therefore, the goal of this review is to explore the relationship between physical office environment and health as recognized within a Nordic perspective.

## **2. Background**

The World Health Organization (WHO) states: 'Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity' [38]. Wellbeing can be defined as 'one's feeling about oneself in relation to the world' [39].

### *Positive health approaches*

Researchers have long tried to explain the positive dimensions of the health continuum by describing terms such as Self-actualization [40], Wellness [41], Psychological wellbeing [42], Flow [43], Flourishing [44], Wellbeing [45] and Salutogenics [46]. For instance, Antonovsky developed the Salutogenic view on health which focuses on the origins of health rather than determinants of disease. He argues the factors that create health are often different from those causing illness. In medicine and health-related disciplines, health is defined as the absence of disease [47] what Antonovsky would consider pathogenic. In pathogenic approach, the starting point is disease and from there, we identify the causes of the problem and eliminate them. Pathogenesis is therefore reactive to disease. Antonovsky argues that, to move toward health, the elimination of risk factors is not enough. Rather he argues we should increase positive factors such as imagination, play, will and meaning would be necessary. Thus, Salutogenesis with a proactive approach, aims to generate better health.

#### *Health perspectives in office research*

The majority of previous research on the indoor (workplace) environment has tended to focus on threats, illness and negative impacts on people. For instance, studies investigated a range of irritative symptoms in office buildings such as eye and nose irritation, difficulty concentrating, skin reactions, mental fatigue and headaches. This led to the recognition of 'sick building syndrome' which refers to a situation when 20 per cent of buildings occupant complain of a similar medical condition, while in the building, because of an unknown cause over a period of at least 2 weeks [48]. Most research thus has focused on removing the harmful stimuli, while the factors which generate a positive experience in the workplace have been overlooked [49]. Only few studies have studied the positive aspects related to work environments that could promote health and well-being [32]. Bluysen (2014) calls for a change of mindset from the current focus on single component to users and improving the quality of their lives. Positive aspects could include participation in planning and design, space personalization, building a sense of control and ability to meet changing needs and preferences.

WHO defines five keys to healthy workplaces as follows [50]: A healthy workplace is one in which workers and managers collaborate to use a continual improvement process to protect and promote the health, safety, and well-being of all workers and the sustainability of the workplace by considering the following identified needs:

- Health and safety concerns in the physical work environment;
- Health, safety and well-being concerns in the psychosocial work environment including organization of work and workplace culture;
- Personal health resources in the workplace; and
- Ways of participating in the community to improve the health of workers.

The definition reflects a shift in perspective from a major focus on physical environment to a more holistic view on the workplace factors including psychosocial and individual health factors [31].

That said, it was only until recent years that health became an integral part of many post-occupancy evaluations (POE), building certifications and standards such as WELL, LEED and BREEAM.

Among those, WELL building standard specifically focuses on health and wellbeing of occupants in buildings. However, there are not many WELL certified office buildings. Moreover, many of these POE's focus on physical measurements and do not include occupant's perception [51].

### **3. Method**

#### *Aim and research question*

The aim of the study was to explore the relation between the physical office environment and employee health as found in Nordic literature.

This review was guided by the following question:

How does the Nordic research relate employee health to office's physical environment?

*Sample and setting*

*The study is situated in the Nordic context, including institutes from Norway, Finland, Sweden, and Denmark. All data has been collected from institutes that focus on workplaces. More literature was identified by analysing the references of the major reports in the field. From their public reports we selected those that addressed the combination of health and workplaces.*

*Data collection*

The data was collected between December 2018 and February 2019. The identified institutes were listed in a table included the name of the institute, a summary of their aims and the country (Table 1). Their reports were collected mainly from their websites.

The texts concerning the built environment was extracted into one document. The focus was on text sections that concerned office design in relation to employee health and well-being.

*Data analysis*

This study is based upon a selective document analysis using written material, developed by others [52]. This included descriptive comparisons for the document set, short enough to allow clear and simple qualitative comparisons. All the selected texts was analysed using content analysis framework [53].

**Table 1.** Listing of identified institution

<b>Institutes</b>	<b>Summary of objectives of the institution</b>	<b>Country</b>
The Nordic Institute for Advanced Training in Occupational Health (NIVA)	“NIVA gathers top experts and knowledge from the Nordic countries and transforms research findings into advanced courses and seminars within the field of occupational health and safety for researchers and practitioners from both the Nordic countries and world-wide.”	Nordic countries
Nordic Innovation Centre	Nordic Innovation is a Nordic organisation working to promote cross-border trade and innovation. Nordic Innovation is a Nordic organisation working to promote cross-border trade and innovation.	Nordic countries
Forskerforbundet	The Norwegian Association of Researchers (NAR) organises employees and students in research, higher education and dissemination of knowledge. NAR’s main purpose is to increase salaries and improve working conditions for our members.	Norway
Helsebiblioteket.no	Helsebiblioteket.no provides free access to subject procedures, reference books, databases, journals and other knowledge resources for health professional.	Norway
Finnish Institute of Occupational Health, FIOH	"The Finnish Institute of Occupational Health (FIOH) is a multidisciplinary research and specialist organization that focuses on well-being at work, research, advisory services and training. We operate under the Ministry of Social Affairs and Health as an independent legal entity."	Finland
Institutet för stressmedicin (ISM)	The Institute for Stress Medicine (ISM) is the Västra Götaland Region is a knowledge centre in the stress area and part of the administration Health and Stress Medicine. They carry out research and development, while also conveying knowledge and experiences about stress, health and psychosocial work environment.	Sweden

Institutet för miljömedicin (IMM). Karolinska Institutet	The Institute for Environmental Medicine (IMM) is an institution at Karolinska Institute and a national expert body within environmental medicine. Activities that span a wide area around the environmental impact on health, with a focus on chemical and physical factors and lifestyle.	Sweden
Det Nationale Forskningscenter for Arbejdsmiljø	The National Research Centre for Occupational Health and Safety (NFA) researches, communicates and educates, and thus contributes to developing a healthy and safe working environment in Denmark.	Denmark
The Danish National Centre for Social Research	The Centre conducts research and carries out commissioned projects in the area of welfare state policies and disseminates the results. Its primary task is to generate new knowledge of relevance to society.	Denmark

#### 4. Results

The details of the publications included in the review were documented in a chart form which included source information (authors, year), title, and addressing health in relation to office environments (Table 2). The results show that the Nordic countries recognise the importance of the workplace impact on employee health. Nevertheless, there is little research relating the physical office environment to positive health approaches in the Nordic countries.

**Table 2.** Listing of included articles

Author(S), year	Title	Addressing health
Bakke, 2007	DEKAR – Den Nordiske Kunnskapsarbeidsplassen (The Nordic Workplace Design for Knowledge Work)	Does not mention anytime direct health outcome, however process-related factors such as employee's participation and space-related such as visibility, proximity and degree of flexibility are addressed.
Bakke & Fostervold 2017	Kontorlandskap – arbejdsmiljøfaglig vejledning	Identifies health outcomes in relation to open plan office, such as Reduced short-term memory, concentration, productivity, wellbeing, false stress alarms and work motivation; Increased fatigue, sick leave days, physiological stress reactions from the heart and vascular system Increased.
Conference proceedings	Towards better wellbeing at work	Among 8 articles from Finland, Sweden and Denmark, 0 papers addressed the physical office environment as a resource for wellbeing enhancement.
Ruohomäki et al., 2015	Salutogenic and user-centred approach for workplace design	Relates salutogenic approach to workplace design
Hultberg, 2018	Sammanfattning av forskningsläget avseende aktivitetsbaserade kontor (ABW)	Identifies risk factors in Activity Based Offices

Toivanen, 2015	Framtidens arbetsplatser: Att utveckla hållbara och friska kontor	Mentions health related outcomes such as better comfort, performance, and job satisfaction
Hultberg et al., 2018	Hälsa på arbetsplatsen	Explores the connections between work, stress and health, and how good conditions for health in the workplace are created.
Kwak et al., 2017	Hälsofrämjande insatser riktade till arbetsplatsens fysiska miljö och organisationsstruktur: effekt på arbetsrelaterade utfall. En kartläggning av forskningen.	Relates health promotion to absenteeism, presenteeism, work performance and workability as well as productivity.

#### 4.1. Reports relating to health

Health as a term is used in 7 articles, however not all of them provide a definition. In fact, only 1 article explicitly referred to the WHO definition; ‘Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity’. One document provided an interpretation of health; “*Health is to feel good and have sufficient resources to meet everyday demands and to be able to realize both personal and professional goals*” [54]. This report goes on and gives a comprehensive overview of studies dealing with the connection between work, stress and health and gives an interpretation of health promotion as well; “*The characteristics of health-promoting workplaces is that the workplace as a starting point should offer good working conditions, a good working climate and provide the pre-conditions for personal and professional development*”.

Other articles included health-related outcomes such as healthy behaviour, mental illness, absenteeism, and work ability. Several others referred to organisational outcomes, such as productivity which is connected to health.

The analysed documents represent two different health perspective:

- a traditional biomedical and pathogenic approach (i.e. physiological stress reactions, fatigue and absenteeism) [55-57];
- a salutogenic perspective referring to presence of positive factors that create health and not the mere absence of disease also known as positive health (i.e. coping, motivation, workability, work engagement and job satisfaction) [54, 58].

The identified positive health approaches, such as workplace health promotion research, were found to focus on psychosocial work environments and simply neglect the complex interplay of the physical environment and the health outcomes. A report reviewed literature on health in the workplace [54]. This document mainly focused on psychosocial work environment. Additionally, it was targeted towards who work in any supporting role to managers, such as HR and occupational health professionals, as well as managers, safety representatives, and students while completely neglecting to address architects and designers who play a major role in the creation of the physical environments.

Similarly, in a conference proceeding ‘Toward better wellbeing at work’ 8 articles from Finland, Sweden and Denmark were extracted and no paper addressed the physical office environment as a resource for wellbeing enhancement [59]. Another study aimed to produce evidence base for health promotion related to eating habits and physical activity [58]. The study included analysis and proposals for how actors at national, regional and local level can participate in long-term work to promote health related to eating habits and physical activity. Nevertheless, the role of the physical environment was limited to promoting healthy behaviour, such as access to healthy food and facilities for increased activities.

#### 4.2. Reports relating to the physical environment



In the reports with a focus on the physical office environment, the health perspective is mainly dominated by traditional risk-oriented health, such as sick leave rate. For example, Bakke & Fostervold [56] looked into open-plan offices and their impact on health, wellbeing and productivity. This study addresses a national debate which started since the Norwegian Ministry of Local Government and Regional Development introduced a maximum of 23 square meters per employee and flex office as the default office type for state buildings. Several influencing factors were identified in the literature such as ventilation, acoustic, ergonomics, the need for recovery, daylight and views, privacy and control. Consequently, the outcomes were increased stress, fatigue, general health, lower motivation and physiological reactions from heart and vascular. It also highlights the need for recovery in relation to office design. Recovery is considered “*the time it takes to come back functionally to the post-stress level after a stress episode has ended*”. This study concluded that society is forced to pay for the benefits of the open plan offices by increased sick leave days and productivity losses.

Two similar reports, focused on future offices and research on open plan and activity-based offices with more focus on the physical environment, but dominated with traditional pathogenic notion of health [55, 57]. There was only one article relating the physical work environment to positive aspects of health [60]. This article identified social, psychological and social dimensions of the workplace that promote wellbeing and presents a framework. They conclude a wellbeing promoting workspace:

- has a good indoor environment;
- supports work tasks and work process;
- is ergonomic and accessible to all;
- respects privacy and the personal need for space;
- strengthens sense of control;
- enhances work flow and work engagement and
- enables communication, collaboration and mutual learning.

Finally, a variety in research orientation was identified within the data. The focus of the results varied depending on the institutes’ disciplinary focus. For instance, several included documents appeared to have a focus on occupational health investigating psychosocial environments in relation to health [54]. Those with starting from an architectural perspective focused on employees’ health and performance in relation to the office type, function, spatial and aesthetic features, as well as factors such as light or sound conditions, indoor air quality and temperature [55, 56, 60]. One document had a management-oriented direction studying how the Nordic managers understand the workplace design and its role as a strategic tool for knowledge sharing [61].

## 5. Discussion

This review set out to explore how literature in the Nordic countries relate employee health to office physical environment. Three main gaps in the literature were identified, including (1) limited understanding of health, (2) unrecognised role of the physical environment and design professions in relation to health, (3) diverse research orientations. The combination of results suggests the paucity of the studies relating the physical office environment to positive health approaches.

Although healthcare building design has dealt with the influence of the built environment on patient health, there is little understanding of health in the field of workplace research. This might be due to lack of transdisciplinary studies especially when (trans)disciplinary research has been considered challenging [62]. Another reason could be due to the contradictory and inconsistent body of research in this field hence making it difficult to draw clear conclusions [63]. Without a common definition or explicit description of health, it becomes difficult to outline health related goals and desired outcomes. Moreover, how health is viewed determines research areas and thereby influences health related policies in a longer run. Our results are in accordance with a study investigated workplace health promotion

research in the Nordic countries and revealed no definition of health was provided by the identified literature [64].

This review reveals the role of the physical office environment in promoting health has been overlooked. Some reports never mention the physical environment and the ones which do are mainly limited to promoting physical activity without explicitly addressing the contribution of physical environment. For example, one of the report gives a relatively comprehensive overview of the existing research on health promotion strategies, however it completely misses to mention the physical environment [54]. Our "environment" includes both social and physical environmental determinants of health. By focusing on one dimension such as the psychosocial environment, it becomes difficult to mobilise accessible resources for better health, in this case, the physical office environment. Especially when the relationship between the environment and health has already been identified as complex.

The diverse research orientation among workplace actors such as management, occupational health professions, architecture and real estate developers presents several challenges. Those challenges might lie in the nature of a discipline and how research questions are determined. For example, occupational health profession research recognizes the influence of the physical work environment on employee health. However, they do not consider the physical work environment as a resource for health promotion. This might be due to the nature of occupational health field that is closer to psychology and therefore more attention is directed towards psychosocial environments rather than the physical environment.

## 6. Conclusion

There is limited knowledge on the relation between the physical environment of offices and employee health. This study investigated how different Nordic institute address this relation in their documentation. The results reveal that more research is needed to design healthy offices, especially including more holistic perspective on health in relation to the physical office environment.

This review offers an opportunity to rethink office design and support dialogue on how better design can improve employee health outcomes. If we seek to incorporate health consideration in the design of the offices, we firstly need to define what health means and what it entails. The conception of health may guide different design choices. Secondly, we need to relate the physical office environment to positive health approaches such as workplace health promotion research including strategies and evaluations. Lastly, with ongoing changes in workplace development, robust terminology among different disciplines can form a basis for discussions between different workplace actors

This review highlights the need for more quantitative and qualitative methods to give relevant knowledge for complex questions regarding the physical office environment and health outcomes of employees. Future research should enable dialogue and collaboration between different actors such as managers, human resources, occupational health professionals and designers, which can benefit the users of office building.

## 7. Reference

- [1] Gallup 2010 *Gallup Global Wellbeing: The Behavioral Economics of GDP Growth* Washington, D.C
- [2] WHO 2018 *Healthy life expectancy (HALE)* Editor Volume Pages
- [3] Lozano R, Fullman N, Abate D, Abay SM, Abbafati C, Abbasi N, Abastabar H, Abd-Allah F, Abdela J, Abdelalim A, and Abdel-Rahman O 2018 Measuring progress from 1990 to 2017 and projecting attainment to 2030 of the health-related Sustainable Development Goals for 195 countries and territories: a systematic analysis for the Global Burden of Disease Study 2017 *Lancet* **392** 10159

- [4] Evans GW and McCoy JM 1998 When buildings don't work: The role of architecture in human health *Journal of Environmental Psychology* **18** 1
- [5] Richards K. C and Bairnsfather L 1988 A description of night sleep patterns in the critical care unit *Heart & lung: the journal of critical care* **17** 0147-9563 (Print)
- [6] McColl SL and Veitch JA 2001 Full-spectrum fluorescent lighting: a review of its effects on physiology and health *Psychological Medicine* **31** 6
- [7] Bayo MV, Garcia AM and Garcia A 1995 Noise levels in an urban hospital and workers' subjective responses *Archives of Environmental Health* **50** 0003-9896 (Print)
- [8] Haddock J 1994 Reducing the effects of noise in hospital *Nurs Stand* **8** 43
- [9] Morrison WE, Haas EC, Shaffner DH, Garrett ES and Fackler JC 2003 Noise, stress, and annoyance in a pediatric intensive care unit *Critical Care Medicine* **31** 1
- [10] Chow T.T and Yang X.Y 2003 Performance of ventilation system in a non-standard operating room *Building and Environment* **38** 12
- [11] Menzies D, Fanning A, Yuan L and FitzGerald JM 2000 Hospital ventilation and risk for tuberculous infection in canadian health care workers. Canadian Collaborative Group in Nosocomial Transmission of TB *Annals of Internal Medicine* **133** 10
- [12] Bell P.A 1981 Physiological, Comfort, Performance, and Social Effects of Heat Stress *Journal of Social Issues* **37** 1
- [13] Poulter Hair L Satisfaction by design. 'Place' component of the marketing mix takes center stage for some providers *Marketing Health Services* **18** 1094-1304 (Print)
- [14] Zimring C, Joseph A, Nicoll GL and Tsepas S 2005 Influences of building design and site design on physical activity: research and intervention opportunities *American Journal of Preventive Medicine* **28** 0749-3797 (Print)
- [15] Jacobs KW and Suess J.F 1975 Effects of four psychological primary colors on anxiety state *Perceptual and Motor Skills* **41** 0031-5125 (Print)
- [16] Steffes R and Thralow J 1985 Do uniform colors keep patients awake? *Gerontological Nursing* **11** 0098-9134 (Print)
- [17] Rabin M 1981 Medical-facility colors reduce patient stress *Contract* **23** 2
- [18] Edge KJ 2003 *Wall Color of Patient's Room: Effects on Recovery* Editor University of Florida
- [19] Connellan K, Gaardboe M, Riggs D, Due C, Reinschmidt A and Mustillo L 2013 Stressed Spaces: Mental Health and Architecture *HERD: Health Environments Research & Design Journal* **6** 4
- [20] Duffy F 1997 *The New Office* London, England Conran Octopus
- [21] Ganster DC, Fusilier MR and Mayes BT 1986 Role of social support in the experience of stress at work *Applied Psychology* **71** 1
- [22] Frese M 1999 Social support as a moderator of the relationship between work stressors and psychological dysfunctioning: a longitudinal study with objective measures *Occupational Health Psychology* **4** 3
- [23] Netterstrøm B, Conrad N, Bech P, Fink P, Olsen O, Rugulies R and Stansfeld S 2008 The relation between work-related psychosocial factors and the development of depression *Epidemiologic Reviews* **30** 1
- [24] Pejtersen JH, Feveile H, Christensen KB and Burr H 2011 Sickness absence associated with shared and open-plan offices--a national cross sectional questionnaire survey *Scandinavian journal of work, environment & health* **37** 5
- [25] Danielsson B.C and Bodin L 2008 Office type in relation to health, well-being, and job satisfaction among employees *Environment and Behavior* **40** 5
- [26] Lahtinen M, S-D C and Reijula K 2004 Psychosocial work environment and indoor air problems: a questionnaire as a means of problem diagnosis *Occupational and Environmental Medicine* **61** 2
- [27] Veitch JA 2001 Psychological Processes Influencing Lighting Quality *Journal of the Illuminating Engineering Society* **30** 1

- [28] Clausen T, Christensen KB, Lund T and Kristiansen J 2009 Self-reported noise exposure as a risk factor for long-term sickness absence *Noise and Health* **11** 43
- [29] De Croon E.M, Sluiter Jk, P P Kuijer and Frings-Dresen M.H 2005 The effect of office concepts on worker health and performance: a systematic review of the literature *Ergonomics* **48** 2
- [30] Duvall-Early K and Benedict JO 1992 The Relationships between Privacy and Different Components of Job Satisfaction *Environment and Behavior* **24** 5
- [31] Clements-Croome D 2011 Sustainable intelligent buildings for people: A review *Intelligent Buildings International* **3** 2
- [32] Bluysen PM 2014 What do we need to be able to (re)design healthy and comfortable indoor environments? *Intelligent Buildings International* **6** 2
- [33] Bassett D, Browning R, Conger SA, Wolff DL and Flynn JI 2013 Architectural Design and Physical Activity: An Observational Study of Staircase and Elevator Use in Different Buildings *Physical Activity and Health* **10** 4
- [34] Nicoll G and Zimring C 2009 Effect of Innovative Building Design on Physical Activity *Public Health Promotion Policy* **30** 1
- [35] Nicoll G 2007 Spatial Measures Associated with Stair Use *American Journal of Health Promotion* **21** 4
- [36] Myerson J and Ramster G 2017 *Architecture: Workplace health and wellbeing: Can greater design participation provide a cure?* Taylor and Francis Inc. 347-357
- [37] W G B Council 2014 *Health, Wellbeing & Productivity in Offices* Council W G B
- [38] WHO 1946 *Preamble to the Constitution of WHO as adopted by the International Health Conference* New York
- [39] Clements-Croome D 2017 *Creating the Productive Workplace* London Routledge
- [40] Maslow A.H 1987 *Motivation and Personality, 3rd edition* New York, US Harper and Row
- [41] Dunn H.L 1959 High-level wellness for man and society *American journal of public health and the nation's health* **49** 6
- [42] Ryff C.D 1989 Happiness Is Everything, or Is It? Explorations on the Meaning of Psychological Well-Being *Personality and Social Psychology* **57** 6
- [43] Csikszentmihalyi M 1990 *Flow: The Psychology of Optimal Experience* New York, US Harper Perennial Modern Classics
- [44] Keyes C.L 2002 The mental health continuum: from languishing to flourishing in life *Health and Socail Behavior* **43** 2
- [45] Healey-Ogden MJ and Austin WJ 2011 Uncovering the lived experience of well-being *Qualitative Health Research* **21** 1
- [46] Antonovsky A 1996 The salutogenic model as a theory to guide health promotion1 *Health Promotion International* **11** 1
- [47] Boorse C 1977 Health as a theoretical concept *Philosophy of Science* **44** 4
- [48] Abdul-Wahab AS 2011 *Sick Building Syndrome: in Public Buildings and Workplaces* Berling Heidelberg, Germany Springer
- [49] Heerwagen J.H, Heubach J.G, Montgomery J and Weimer W.C 1995 Environmental Design, Work, and Well Being: Managing Occupational Stress through Changes in the Workplace Environment *AAOHN Journal* **43** 9
- [50] Burton J 2010 *WHO Healthy Workplace Framework and Model: Background and Supporting Literature and Practices* Geneva: Organization W H
- [51] Bae S, Asojo A, Guerin D and Martin C 2017 A Post-Occupancy Evaluation of the Impact of Indoor Environmental Quality on Health and Well-Being in Office Buildings *Organizational Psychology* **17** 6
- [52] Bowen GA 2009 Document analysis as a qualitative research method *Qualitative research* **9** 2
- [53] Stemler S 2001 *An overview of content analysis in practical assessment* 7
- [54] Hultberg A, Ahlborg jr G, Jonsdottir I, Winroth J, Corin L and Heimdahl M 2018 *Hälsa på arbetsplatsen. En sammanställning av kunskap och metoder*

- [55] Toivanen S 2015 *Framtidens arbetsplatser. Att utveckla hållbara och friska kontor* AB N P D
- [56] Bakke J.V and Fostervold K.I 2017 *Kontorlandskap – arbetsmiljöfaglig veiledning* Norway Helserådet
- [57] Hultberg A 2018 *Sammanfattning av forskningsläget avseende aktivitetsbaserade kontor (ABW)*
- [58] Kwak L, Grimani A, Aboagye E and Hagströmer M 2017 *Hälsöfrämjande insatser riktade till arbetsplatsens fysiska miljö och organisationsstruktur: effekt på arbetsrelaterade utfall. En kartläggning av forskningen.* Stockholm Institutet K
- [59] Anttonen H and Vainio H 2010 Towards better work and well-being: an overview *Towards Better Work and Well-being* **52** 12
- [60] Ruohomaki V, Lahtinen M and Reijula K 2015 Salutogenic and user-centred approach for workplace design *Intelligent Buildings International* **7** 4
- [61] Bakke J.W 2007 *DEKAR – Den Nordiske Kunnskapsarbeidsplassen (The Nordic Workplace Design for Knowledge Work)*
- [62] Femenías P and Thuvander L 2018 Transdisciplinary Research in the Built Environment: A Question of Time *Technology Innovation Management Review* **8** 8
- [63] Sailer K, Budgen A, Lonsdale N, Turner A and Penn P 2009 *Evidence-Based Design: Theoretical and Practical Reflections of an Emerging Approach in Office Architecture* Editor Sheffield, UK Sheffield Hallam University
- [64] Torp S and Vinje H.F 2014 Is workplace health promotion research in the Nordic countries really on the right track? *Scandinavian Journal of Public Health* **42** 15 Suppl