



Places and Technologies 2015

# KEEPING UP WITH TECHNOLOGIES TO MAKE HEALTHY PLACES

Nova Gorica, Slovenia, 18.–19.6.2015

# PT2015

## BOOK OF CONFERENCE PROCEEDINGS

*A healthy city is one that is continually creating and improving those physical and social environments and expanding those community resources which enable people to mutually support each other in performing all the functions of life and developing to their maximum potential.  
Health Promotion Glossary (1998)*



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**Places and Technologies 2015**

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**Editors:**

Alenka Fikfak, Eva Vaništa Lazarević,  
Nataša Fikfak, Milena Vukmirović, Peter Gabrijelčič

Nova Gorica, Slovenia



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## **RESPONSIBILITY TO THE EMPLOYEES' HEALTH UNAVOIDABLE IN THE CREATIVE AND INNOVATIVE DESIGN OF OFFICE SPACES**

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**Nikola Z. Furundžić**<sup>1</sup>

Dentist, Dental practice "Furundzic ordinacija", Belgrade, Serbia,  
stomordinacija227@gmail.com

**Dijana P. Furundžić**

Dentist, Dental practice "Furundzic ordinacija", Belgrade, Serbia,  
diananikola@gmail.com

**Aleksandra Krstić-Furundžić**

PhD, Full professor, Faculty of Architecture, University of Belgrade, Bulevar kralja  
Aleksandra 73/II, 11000 Belgrade, Serbia, eakrstic@arh.bg.ac.rs

### **ABSTRACT**

*Office space should be designed to provide better productivity and creativity of employees, while preserving their health. Majority of the employees spend most of the day in the office. Workspaces greatly affect the psychological well-being and activities and abilities of employees. Health of employees, which directly affects productivity, is conditioned by the office type. The main objective of this paper is to show the influence of innovative office space design on the employees' health and to highlight the harmful environmental factors that affect human health. The findings of this study show that office design is very vital in terms of causing or preventing physiological and psychological reactions. Functional features of various types of offices have a different effect on the employee's ability to perform the personal control. In the case of different types of offices, there are different perceptions of stress in men and women. Some negative health outcomes, like stress, decreasing ability of personal control and TMD-related symptoms are considered.*

**Keywords:** office types, employees' health, office harmful environmental factors, TMD-related symptoms.

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<sup>1</sup> Corresponding author





## **INTRODUCTION**

Humans are subject to constant change as a result of adaptation to changing environmental conditions to which they affect more and more. The term Environment of Evolutionary Adaptation is used to denote the qualities of the environment humans are adapted to live in (Crawford and Krebs, 1997; Irons, 1998). This also applies to office space or working environment. Office space has been evolved with the progress of new technologies and grows of corporate culture. The new architectural and interior design is dynamic process and it should be updated. Buildings as objects become intelligent in the moment of gaining computer ability (Sherbini and Krawczyk, 2004). Sherbini and Krawczyk remark that the first intelligent building used technology to provide a comfortable, secure, and energy-conscious environment and that the intelligent building concept offers the connection and integration of HVAC, access, lighting, security, monitoring, management, and telecommunication. On the other hand, just like the architectural remains of past civilisations, office buildings can be regarded as artefacts and their interiors, layout and architecture tell something about the social structure and social relationships of their inhabitants (Voordt et al., 2003). In some literature office buildings are considered as artefacts of corporate culture (Voordt et al., 2003).

New technology and design can be generators of stress for employees in offices. The main objective of this paper is to show the influence of innovative office space design on the employees' health and to highlight the harmful environmental factors that affect human health. Some negative health outcomes, like stress, decreasing ability of personal control and TMD-related symptoms are considered. Methodological approach includes the review and comparative analysis of the relevant literature and linking the various research results.

## **OFFICE TYPES AND EMPLOYEES' HEALTH**

Majority of the employees spend most of the day in the office. Workspaces greatly affect the psychological well-being and activities and abilities of employees. When it comes to office buildings can be noted that the impacts relate to the type of office. A space in the office may contain several different activities, either simultaneous or sequential, and its boundary may be more or less substantial, varying from a solid wall to a line in the carpet (Raymond and Cunliffe, 1997). Organization and division of space depends on the needs of companies.

The office type can reinforce or thwart personal control by its architectural and functional features (Danielsson, 2010). This means that architectural features such as size, location and permeability of interior rooms has an impact due to its influence on the degree of social control, interaction and privacy (see review in Evans, 2003). But also functional features such as ability to work flexible and support feelings of autonomy and confidence at work at an individual and group level has an impact on personal control (Danielsson, 2010). Conventional and



innovative office concepts can be described according to three dimensions (Croon et al., 2005): (1) the office location (e.g. telework office versus conventional office); (2) the office lay-out (e.g. open lay-out versus cellular office); and (3) the office use (e.g. fixed versus shared workplaces). There is not a strict special definition of combi-office; in some combi-offices the employees have individual rooms in others they have an individual workstation in an open plan office layout (Danielsson, 2008). However, the major explanation for the high stress level among combi-office employees is probably not found in the features of the office type, but within the field of leadership and management as employees in combi-offices reported significantly lower job satisfaction compared to other employees (Danielsson and Bodin, 2008). According to the research of Danielsson and Bodin, it can be noted that the adaptation to office type is different for men and women when taken into account the perception of stress. These authors point that men prefer cell-office type (4-9 people in room) and women prefer open space office. Their conclusion is that the level of stress in many cases is related to the type of office and gender.

#### **OFFICE HARMFUL ENVIRONMENTAL FACTORS**

Light, noise, air quality, person-environment (P-E) should be considered as generators of stress in office space. Stress factors are divided into physical factors and social factors. The design of office space should consider all mentioned factors in order to make working environment healthier.

Light is essential that people perform their daily activities, both in the home and at work. The presence of windows in the workplace and access to daylight has been linked with increased satisfaction with the work environment (Boyce, Hunter and Howlett, 2003). Lighting has an influence on our psychological wellbeing and the perceptual qualities of light are the ones stimulating spatial experiences and sensations such as satisfaction, safety, comfort, relaxation and stress, etc. (Flynn, 1977). It is important to provide daylight along with opportunity to control glare and lighting levels (Boyce, Hunter and Howlett, 2003). Contemporary office is characterized by the use of VDU - Visual Display Unites, which imposes a specific spatial organization in order to avoid reflections on the monitors and to achieve working comfort.

Air quality is associated with ventilation. Ventilation systems should be designed so as to provide thermal and air comfort, and therefore the health of people. For thermal comfort ventilation, indoor spaces must receive a sufficient quantity of outdoor air that is warmed or cooled to satisfy human thermal comfort needs (Hedge, 1996). Hedge notes that for health ventilation, indoor spaces must receive air that is free from hazardous chemical or microbiological contaminants. Temperature and air quality in offices affect positively or negatively on employee satisfaction (BOSTI, 1981).



Noise is unwanted sound and represents the environmental stressor within the office space. Noise is the most important environmental factor in office environments since it is: a) the single most common reason for complaints in offices with open plan layouts, and b) it correlates with office employees' environmental dissatisfaction (Nemecek and Grandjean, 1973). Computers, printers, copiers, heating and air conditioning units, telephones and conversations of employees cause noise in the office environment. As the technology develops in the offices will be more gadgets that will produce more noise.

Person-environment (PE) fit theory is a method for understanding the process of adjustment between employees and their work environments. With a reduced degree of personal enclosure, open-plan layout often fails to isolate the occupants from unwanted sound (i.e. sound privacy) and unwanted observation (i.e. visual privacy), resulting in the overall feeling of loss of privacy and personal control over their workspace (Danielsson and Bodin, 2009; Kim and Dear, 2013). Consequently, occupants experience excessive uncontrolled social contact and interruptions due to close proximity to others and perceived loss of privacy, known as overstimulation, which leads to occupants' overall negative reactions toward their office environment (Maher and Hippel, 2005; Kim and Dear, 2013).

### **HEALTH PROBLEMS - RESPONSE TO ENVIRONMENTAL STRESSORS**

According to Esch and Jones stress is now used as an umbrella term that summarizes the effects of psychosocial and environmental factors on physical or mental well-being (Esch, 2002; Jones et al., 2001; Esch et al., 2002). The same authors noted that stress may cause or exacerbate disease processes depending on the type of stressor involved (e.g. physical, chemical, biological, mental, social, etc.) and/or the duration of its influence on an organism.

There is a correlation between stress and bruxism as a problem in orofacial region (Wieckiewicz et al. 2014). According to The International Classification of Sleep Disorders, sleep bruxism (SB) is defined as a 'stereotyped movement disorder characterized by grinding or clenching of the teeth during sleep' (AASM, 2005). During sleep bruxism, both clenching and tooth-grinding are observed and it can cause tooth destruction, temporomandibular dysfunction (TMD) (e.g., jaw pain or movement limitation), occasional headaches, and the disruption of the bed partner's sleep due to the grinding sounds according to these authors (Bader and Lavigne, 2000). Studies that were conducted in Japan related to TMD (Nishiyama et al. 2012) report that the prevalence of TMD-related symptoms (TRS) was higher in working population (approximately 17–18%) than in the general population (5–12%). They point out psychological irritation resulting from duties in the workplace, changes in the work environment, interpersonal relations and an achievement-oriented climate. They also indicate the necessity of investigating the associations (correlation) between TRS and the work environment, business hours, amount of sleep, and other related factors. Research of Nishiyama et al. shows that



the PC use time was longer for the high-TRS subjects than for the low-TRS subjects and that each additional 2 h of a subject's mean PC use time increased the subject's TRS morbidity 2.23-fold, e.g., subjects who used PCs 4 h per day had 2.23-fold higher rates of TRS than subjects who used PCs 2 h per day (Nishiyama et al., 2012).

## CONCLUSION

New technology and design can be generators of stress for people who work in office space. Technology cannot be isolated from the modern lifestyle, which should be kept in mind during the design of commercial buildings and office interiors. Big challenge is to combine intelligent building concept, corporate culture in architecture and healthy environment. In that sense, the paper pointed out harmful environmental factors which are generators of stress in office spaces. Focus is given to bruxism and TMD as stress-related illnesses.

To reduce the incidence of stress-related illnesses, it is necessary to mitigate the impact of stressors in office space and to implement new features to control the stress. Some studies point out that the visual environment is important for stress recovery and stress reduction is faster in Nature compared to urban environments (Ulrich, 1999). A theoretical examination of aesthetic values points towards the importance of elements reflecting Nature; such as complexity, choice of colours, perspective and balance (Grinde, 1996).

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