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Design healthy working environments during the COVID-19 period

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Research highlights

Write 2 to 5 bullet points that

1) This project explored measures for preventing or limiting the transmission of COVID-19 in indoor office workplaces, focusing on space and place by promoting healthy behaviours within those environments

2) The implications of COVID-19 for workspace are more timely than ever, so shading light in the relationship between individuals and their working spaces and how this affects workers is of great importance

3) This review considered a number of questions that companies will need to take into account in the future to plan and design their workspaces, keeping in mind the people who uses them and their needs

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Keywords: design; healthy working environments; indoor office workplace; architecture; COVID-19;

1. Introduction

COVID-19 has affected most of our activities in multiple ways, by changing our working environment being one of them. The pandemic led to unprecedented changes in people's lives, affecting differently individuals across age groups, causing implications to both their well-being and mental health (Hampshire et al., 2021). Healthcare (i.e. high burden of the medical system), social (i.e. social distancing, stress among people) and economic impact (i.e. losses in both national and international business), are some of the main domains affected by COVID-19 (Haleem et al., 2020). Several public health interventions were adopted so as to mitigate the spread of COVID-19, such as social distancing which had an impact on reducing SARS-CoV-2 transmission globally (Zhang et al., 2020), restriction of mass gatherings, travel restrictions, city lockdown, mask wearing and community-wide policies, contact tracing and testing etc. (Ayouni et al., 2021).

Indoor spaces in particular, can pose a significant infection transmission risk (Qian et al., 2020) and therefore, it is imperative to rethink how we share these environments. The different routes of virus infection transmission — airborne, close contact, fomite surface (Tellier et al., 2019) and ocular surface routes (Zhang et al., 2020)— raised even more the risk indoor space can pose to the transmission of the virus. Especially in shared indoor environments like the workspace, further protective measures are needed beyond hygiene practices and use of face masks. Surface hygiene measures, building parameters and systems, contact tracing methods and testing, modifications in the layout of offices, special considerations for elevators, proper staff training for protection and a central management system, are some of the measures that need to be integrated as part of a strategy to face the COVID-19 outbreak in the workplace (CDC, 2021). Additionally, behavioral advice measures should be taken into account, as the idea of working at a high-risk contagious environment or at an insufficient precautionary workplace, could lead to poor mental health outcomes or post-traumatic stress symptoms (Brooks et al., 2018). Understanding how office layout and the ways people use shared spaces affects disease transmission could help in developing effective measures for when people get back to work and make them feel safe in their working environment as well. This project explored strategies and control measures for preventing or limiting the transmission of the SARS-CoV-2 virus in indoor office workplaces. The study focused on three areas of advice: clinical, behavior and the built environment and building systems advice.

2. Theories and Methods

Since the beginning of the COVID-19 outbreak in China, contaminated surfaces were identified as a route of transmission (CDC, 2020). Since then, a number of studies have been performed, investigating how long the virus remains viable or capable of infecting human cells, on a number of different surfaces (Kampf et al., 2020; Fears et al., 2020). Even though SARS-CoV-2 on surfaces remains viable for some time, it is a relatively easy virus to inactivate. Research has shown different disinfectants and cleaning products, such as soap, alcohol in the form of ethanol or propanol or household bleach which used as instructed by the manufacturer, can inactivate the virus (Chin et al., 2020; Kampf et al., 2020). The surface material itself could play an important role, with the most easily cleanable surfaces to be hard and smooth and the least cleanable to be soft and porous (Detry et al., 2010).

During the outbreak of COVID-19 pandemic, the daily routine disruptions and the fact that for long periods people were living under a number of restrictions, a strong psychological impact has been noted on general population (Brooks et al., 2020). Although returning to work has been proposed as a relevant psychoneuroimmunity preventive strategy, workplace could become a highly contagious setting for SARS-CoV-2 transmission (Kim & Su, 2020). Research has shown that organisational/managerial arrangements including workplace hygiene practices and concerns for staff, were associated with less anxiety, depression and psychological distress as well as less severe psychiatric symptoms for its workers (Tan et al., 2020). It is already known from healthcare architecture research what an important role in supporting people's mental health environment can play (Chrysikou, 2014). Obviously, in healthcare settings we can see the corelation between space and health more clearly because people have decreased coping abilities. In spaces where people tend to be more functional, including workplaces, they can employ more mental and physical ways to adjust their practice and cope (Forooraghi

et al., 2021) Overall, these measures could contribute in making the experience of returning to work more tolerable while feeling more secure.

Apart from contaminated surfaces and respiratory droplets, airborne transmission is also a route of contamination, especially in poorly ventilated spaces. Office workers should be provided with the maximum possible delivery of fresh, clean air indoor areas. Ventilation mechanisms, airflow, temperature and humidity levels could influence the virus transmission (REHVA, 2020).

The research team applied two approaches in collecting material to reply to the three areas of interest presented above: first, a literature review was conducted using both systematic and narrative approaches. For the systematic search, four electronic databases were used: PubMed-Medline, Web of Science, Scopus and Google Scholar. For the narrative literature, search was conducted for the identification of eligible studies and guidelines from the government, health agencies and the industry. Key terms and free-words were introduced into web search engines and the eligibility was based on ad hoc selection and research experience. For the narrative approach, at the end of each recommendation the phrase 'Top Down' (in case it was government guidance) or 'Bottom up' (if it came from the industry, academia or regulatory bodies) was applied. Second, a series of workshops were held between the research team and the client/delegates, were the main findings were presented and the implications for office workplaces design were discussed, creating knowledge by bridging the gap between academia and the industry.

3. Results

Findings were organized under the three main areas of this study: clinical, behavioral and built environment advice.

3.1. Clinical advice

Evidence has shown that SARS-CoV-2 tend to persist on surface (for different period based on the surface material) and in air for long periods of time (Kampf et al., 2020). As a result, contaminated droplets especially on high touch surfaces, such as offices tables, kitchen areas, bathrooms, lift buttons, could pose a great risk for office workers. The material of surfaces could also play an important role, as certain materials could be more porus and as a result more difficult to disenfect (Detry et al., 2010).

3.2. Behaviour and the built environment advice

Behavioural aspects of returing to work during COVID-19 period could be related to psychological distress and mental health outcomes. Research flagged the importance of social distancing in the workplace as well as the necessity of workers' training to the new protocols and the company's response plan in case of COVID-19 emergency. New behavioural patterns such as hand hygiene practices, face mask wearing, desk cleaning were also pointed (Perkins & Will, 2020). A number of key suggestions derived from literature and narrative review focusing on themes such as entering the building, guidelines for visitors, specific guidelines including layout for reception/lobby, common areas/lounges, work booths/workstations, coffee islands/kitchens, meeting rooms, shared spaces, circulations spines, furniture and storage areas, technology use and hygiene guidance Psychological distress could derive from other factors as well, such as the building one is working, the journey to work or indoor environment parameters, such as artificial light or daylighting (Bedrosian & Nelson, 2017). Since this paper is about the UK, where there is less regulation in comparison to other countries related to daylight, examples of office spaces which could be dark (flickering for instance), could be less annoying in the pre-Covid period when there were other positive destructions (such as refreshments or a coffee machine) and more co-workers, as opposed to the post-covid period with restrictions and stripped down offices. Research shown that it is important to prepare buildings accordingly so as to welcome back workers. Measures such as thorough cleaning and disenfection, strategically placed touch-free sanitizerstations and signage, measures while entering such as temperature check, sitting reconfiguration in the working spaces were highlighted (HM Government, 2020; CBRE, 2020). Additionally, indoor environment parameters can play an important role such as daylighting, air quality, green and blue spaces (for example, indoor plants or a fountain or any other water feature such as an aquarium) and indoor movement patterns could affect the physiological-psychological wellbeing on a positive way. Daylighting is preferred for visual comfort to artificial lighting and exposure to optimised daylight in an office space

can have a positive effect on cognitive performance of occupants at these spaces, increase productivity and positively affect sleep-activity patterns (Boubekri et al., 2014,2020).

3.3. Building systems advice

Research shown in order to miminse the risk of airborne transmittion, it is imperative to increase the flow of fresh air ventilation, either by manually operable windows or by mechanically-ventilated mechanisms. It is necessary to review the operation of heat and air-circulation systems in the office space, so as to minimise the re-circulation of air and air leakage as much as possible (ASHRAE, 2020, REHVA, 2020). Recommendations coming up from research suggested among others increasement in the rate and duration of ventilation, review of the heat recovery systems and room-based fan coil and split systems to avoid the risk of cross contamination and advanced filtration through HEPA and UVGI filters (CIBSE, 2020).

4. Discussion

Results shown how COVID-19 for many people has taken away the pleasure derived from their work environment and flagged areas of concern but also practical measures that could help in reshaping more effectively the working space. Environments that until recently would have been considered safe, now could be perceived as vulnerable and need to be adjusted. Under the current circumstances, special attention should be paid to the working spaces configuration, disinfection and cleaning measures but also to employee mental health, which may have been affected negatively. It is imperative to support the health, safety and wellbeing of employees, especially the re-evaluation of their particular needs while returning to work, so as to make the journey to work worthwhile.

5. Conclusions

This project shed light on the interrelationship between individuals and their office space, how the latter influences workers and to the knowledge transfer from the area of health humanities that aims to understand and provide for the perception and physiological changing needs that occur as a result of illness or disease; in that case, to office design for Covid-19, a time that was challenging for intervention, casting prevention a critical path for the control of the disease and the morbidities related to it. The research team identified the need to have a systemic approach on how ones deal with the return to the office during /post COVID-19 and take into account all seven topics: vulnerability assessment and the workplace, employee mental wellbeing, interactions with surfaces, building service systems, behavior change and trust, and offices worth the journey. Some of these themes have been prioritized, such as infection control and hygiene while others were lost so as to mitigate the risk, such as the employee mental wellbeing as well the social interaction in the workspace. This project identified the importance of all themes and how these could be addressed in the office space through built environment interventions imperative that occupants and facilities managers are well informed and work together not only to keep spaces clean so as to reduce the risk of transmission, but also to reconfigure the vulnerable spaces so as to provide offices that are worth the travel. This cross-disciplinary review raised questions that need to be considered in future studies inclusive of other topic areas apart from the ones discussed here, so as to generate interdisciplinary knowledge on other equally important fields of study which will impact companies that plan and design workspaces and the people who use it, promoting both healthy working environments and behaviors.

Contributor statement

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