Are workspaces gender neutral? A literature review and a research agenda

Alessandra Migliore*

Department of Architecture, Built Environment and Construction Engineering (ABC) & Department of Management, Economics and Industrial Engineering (DIG), Politecnico di Milano, Milan, Italy
ORCiD: https://orcid.org/0000-0002-7944-1671
LinkedIn profile: www.linkedin.com/in/alessandra-migliore
* Corresponding Author: alessandra.migliore@polimi.it

Cristina Rossi-Lamastra

Department of Management, Economics and Industrial Engineering (DIG), Politecnico di Milano, Milan, Italy
ORCiD: https://orcid.org/0000-0002-4128-7197
LinkedIn profile: www.linkedin.com/in/cristina-rossi-lamastra-50791a3

Chiara Tagliaro

Department of Architecture, Built Environment and Construction Engineering (ABC), Politecnico di Milano, Milan, Italy
ORCiD: https://orcid.org/0000-0002-3023-5340
LinkedIn profile: www.linkedin.com/in/chiara-tagliaro

ABSTRACT

This study undertakes a systematic literature review (SLR) on how the workspace influences female workers and, more generally, gender equality. Within the broader context of Diversity, Equity, and Inclusion (DE&I) matters, gender issues have attracted ample attention from scholars and policymakers. However, research on the specific topic of this SLR is sparse and fragmented, especially for what concerns the implications on workplace design and management. This paper systematizes the actual knowledge on the subject by reviewing 68 articles published in the last ten years. Authors critically analyze these articles according to two vital spatial elements: *workspace typologies* and *workspace interiors*. The reviewed articles document a general convincement shared by different scientific fields that the workspace affects women and men differently. The results show that space is a crucial element for enhancing gender equality in the workplace. Although the reviewed articles cover multiple disciplines, an interdisciplinary approach is still missing. The concluding section proposes a future research agenda, novel theoretical approaches and methodological advancements, while highlighting practical implications.

Keywords

Workspace; office; gender; women; equality.

INTRODUCTION

To align with the United Nations' call to achieve Sustainable Development Goals[1], firms are currently urged to take action to promote Diversity, Equity, and Inclusion (DE&I). DE&I principles are essential drivers for organizations' strategies nowadays, with numerous firms appointing "Chief Diversity Officers" (Oracle, 2021). Given the multiple dimensions of DE&I (*e.g.*, sexual orientation, disabilities, culture, socioeconomic origins, educational levels, and work experience, McKinsey, 2022), it is essential to develop an in-depth knowledge of each of these dimensions in organizations. Some organizations have reached satisfactory results in gender equality, and they are now focusing their attention on other areas.

Nevertheless, research on gender in the work environment revolves mainly around factors that facilitate or hamper women's career progression and well-being at work (*e.g.*, Heilman, 2012). The *workspace* – consisting of the interactions between the physical space and its users (Hills & Levy, 2014) – has gone under-remarked among these factors.

Evidence exists that the workspace affects male and female workers differently (Wasserman & Frenkel, 2015). For instance, researchers have shown that women are generally more concerned about their workspace than men, who tend to be more neutral towards it (Danielsson et al., 2015). The broader debate on post-occupancy assessment, occupant satisfaction, user-centered design, and constructivist theories in the design and control of buildings (*e.g.*, Parkinson et al., 2018; Hartog, Weijs-Perrée & Appel-Meulenbroek, 2018; Leder et al., 2016) shows that female workers are typically less satisfied with the physical features of the work environment, especially for what concerns air quality and temperature. Nevertheless, the effects of the physical working environment on equality issues at work remain blurred.

[1] For further information see: https://sdgs.un.org/goals

Moving from these premises, the authors develop the first Systematic Literature Review (SLR) on workspace and gender, which systematizes extant knowledge on how the workspace influences female workers – and, more generally, gender equality – and unearths the challenges that workspace elements pose to women. The reviewed literature spans different fields, and either puts gender at the core of the investigation or considers gender as one of its inquiring dimensions.

This is the first literature review on this topic to the best of the authors' knowledge. The burgeoning literature on space in organization and management studies has been recently reviewed by Weinfurtner & Seidl (2018), who revamped the concept of a "spatial turn"[2] in organizations. However, this review just briefly touches on gender. Likewise, mainstream workspace management and design contributions rarely focus explicitly on gender, mainly interested in advancing architecture-related conversations.

Scholars across multiple disciplines have generally considered workspace and gender-related issues as independent research matters, despite the increasing awareness that *space is not gender-neutral* and organizational space is *gendered and gendering* (Baldry, 1999; Wasserman & Frenkel, 2015). For instance, Baldry (1999) considers uneven space allocation, use, and control between women and men in organizations as a result of gendered hierarchies, career progressions, and, in general, a gendered society where "men build, women inhabit" (p. 542, op. cit.). Given the disciplinary variety of the reviewed articles and following up on the review about organizational space by Weinfurtner & Seidl (2018), this study analyzes the literature to disentangle what different researchers mean when discussing workspace and gender. Moreover, this paper acknowledges the diversity of authors' viewpoints, which reflect several theoretical perspectives and lenses on space and gender. Specifically, it aims to answer the following questions: which workspace elements challenge female

[2] With the term *spatial turn* scholars mean the raising interest that space is having in multiple disciplines, including organization and management sciences, economics, sociology, philosophy, anthropology.

workers and gender equality? How can scholars and practitioners rethink the theme of workspace and gender?

The following section describes the methodology applied to conduct the SLR. Then, the paper illustrates the contents of 68 articles, systematized according to a thematic framework, and discuss the most relevant theories and methodologies in these articles. The concluding section highlights relevant research gaps, proposes a research agenda, and discusses practical implications.

METHODOLOGY

The search strategy of identifying relevant articles

Following Tranfield et al. (2003), to perform this SLR, authors implemented a structured searching process for all publications written in English until 2021 by running queries on the online database Scopus[3]. The queries are based on combining two sets of keywords through the logical operator AND. The first set of keywords referred to the gender-related vocabulary and included: "gender," "female," "wom?n", "femini*," "discrimination," "gender bias*," "stereotype*," "equality," and "performativity." The second set referred to workspace design and management, including: "workspac*," "space plan*," "organiz* space*," "organis* space*" "office space*," "meeting room*," "office design," "co-work*," "collaborative space*," "flexible office*," "flexible workspace," "multi-locat* work*," "home office*" and "work from home."

It is worth noting that – as in Taylor & Spicer (2007) – in this contribution, the term *space* is used as an umbrella construct to include a variety of physical contexts that the term *place* does not embrace. On the one hand, the term *space* is more neutral across disciplines than the term *place*; on the other,

[3] Following Sinicropi & Cortese (2020), this SLR used the Scopus database because it is interdisciplinary and focuses on high quality research.

the *workplace* often refers to the organizational environment from a human resource point of view, meaning job position. On the contrary, this paper focuses on *workplace design*. Therefore, the word *workspace* was most appropriate for describing organizational, spatial, and physical environments. By combining these two sets of keywords, the authors formed 117 queries, obtaining more than 120,000 documents narrowed down by applying a set of selection criteria.

Inclusion and exclusion criteria

The authors considered several inclusion and exclusion criteria. First, authors believe that the last ten years of research (2010-2021[4]) is a meaningful time window. As also noted by other recent SLR studies (*e.g.*, Weinfurtner & Seidl, 2018), authors assume that papers published in the last decade likely capture the central insights of prior research. As a check, in April 2022 the authors have re-run the queries and selected only the articles published before 2010. When excluding the disciplines that are out of the scope of this SLR (*e.g.*, 230 papers in the field of Medicine and 104 papers in the field of Neuroscience), only 89 papers remained. Among these, only 10 articles consider *both* the spatial and gender dimensions of work. The authors did not include these papers in the SLR since three (Halford, 2006; Kwallek & Lewis, 1990; Karjalainen, 2007) are cited in the most recent literature; while the authors reviewed and cited the other 7 articles (*i.e.*, Bain, 2004; Halford & Leonard, 2003; Hedge, 1984; Johnson, 1999; Johnson, 2007; Laegram, 2008; Ne'eman et al., 1984) as context studies of the SLR.

Second, the authors included just articles published in peer-reviewed journals and excluded book chapters and conference proceedings for ensuring high quality. Third, to value the interdisciplinarity and multiple viewpoints of the theme, this SLR included articles from the fields of management, economics, business, architecture, engineering, human resources, gender studies, psychology, social

[4] The authors run the queries in April 2021.

sciences, and all the subject areas that gave consistent results according to the scope of the research. Finally, although the overarching goal of an SLR is to depict a full view of existing research, authors focus on specific geographical areas. Namely, the geographical boundaries were limited to countries that share similarities in (formal and informal) institutions regarding gender equality, legal frameworks against gender discrimination, and the development of policies and strategies for gender equality in the workplace. Indeed, this work aims to disentangle the effects of workspace features on gender equality to further support the implementation of DE&I strategies. To this end, it is essential to consolidate a coherent knowledge base rather than comparing and contrasting cross-country differences.

Therefore, authors selected the top 30 countries as ranked in 2019 by the Human Development Index (HDI)[5] *and* which have a Gender Inequality Index (GII)[6] lower or equal to that of the United States (0.204). As a proxy of the country to which the paper refers, authors use the country/territory filter in the Scopus Database; this, in turn, coincides with the country of affiliation of the first author. This choice seems reasonable because the first authors are likely those who have contributed the most to the papers. Therefore, the geographical location of their affiliation should reflect the cultural context where they live or work. However, the first author's affiliation may differ from the affiliation of the co-authors. For this reason, authors manually checked the 68 papers included in the review to see whether the affiliation of the complete set of co-authors of each paper was homogenous at the country level. This happens for 67 articles out of 68. In the end, the following countries are included: Norway; Switzerland; Ireland; Iceland; Germany; Sweden; Netherlands; Australia; Denmark; Finland; Singapore; United Kingdom; Belgium; New Zealand; Canada; United States; Austria; Japan; Israel;

[5] Human Development Index is developed by the United Nations. The complete ranking for 2019 is available at: http://hdr.undp.org/en/content/human-development-index-hdi

[6] The full ranking based on the Gender Inequality Index (2019) is available at: http://hdr.undp.org/en/content/gender-inequality-index-gii.

Slovenia; Korea (Republic of); Luxembourg; Spain; France; Czechia; Malta; Italy; Estonia. Overall, after introducing the geographical boundaries in our search, around 150 articles were dropped. Clearly, in the concluding section, authors call for future research that expands the geographical boundaries of the investigation to compare and contrast evidence from different countries.

Selection of the articles

After applying the inclusion and exclusion criteria mentioned above, 2,079 articles were left. The authors assessed their relevance for this literature review by reading their titles and abstracts. Duplicated articles and articles whose titles and abstracts were unrelated to the central theme (1,877 articles) were dropped. For instance, the authors eliminated many articles which refer to workspace and gender as two separate matters. The remaining articles (n=202) were assessed by reading them entirely. After an in-depth discussion, the authors included in the review 68 articles that jointly address the topics of workspace and gender; they excluded the remaining 134 articles because they found these contributions out of scope after reading their entire text. For example, some papers analyzed work flexibility or work-from-home arrangements without referring to the physical characteristics of the premises where off-site work takes place (*e.g.*, Essig and Soparnot, 2019; Fuller and Hirsh, 2019). Figure 1 shows a flow diagram of database searches and the election of articles according to the PRISMA statement[7].

[7] www.prisma-statement.org

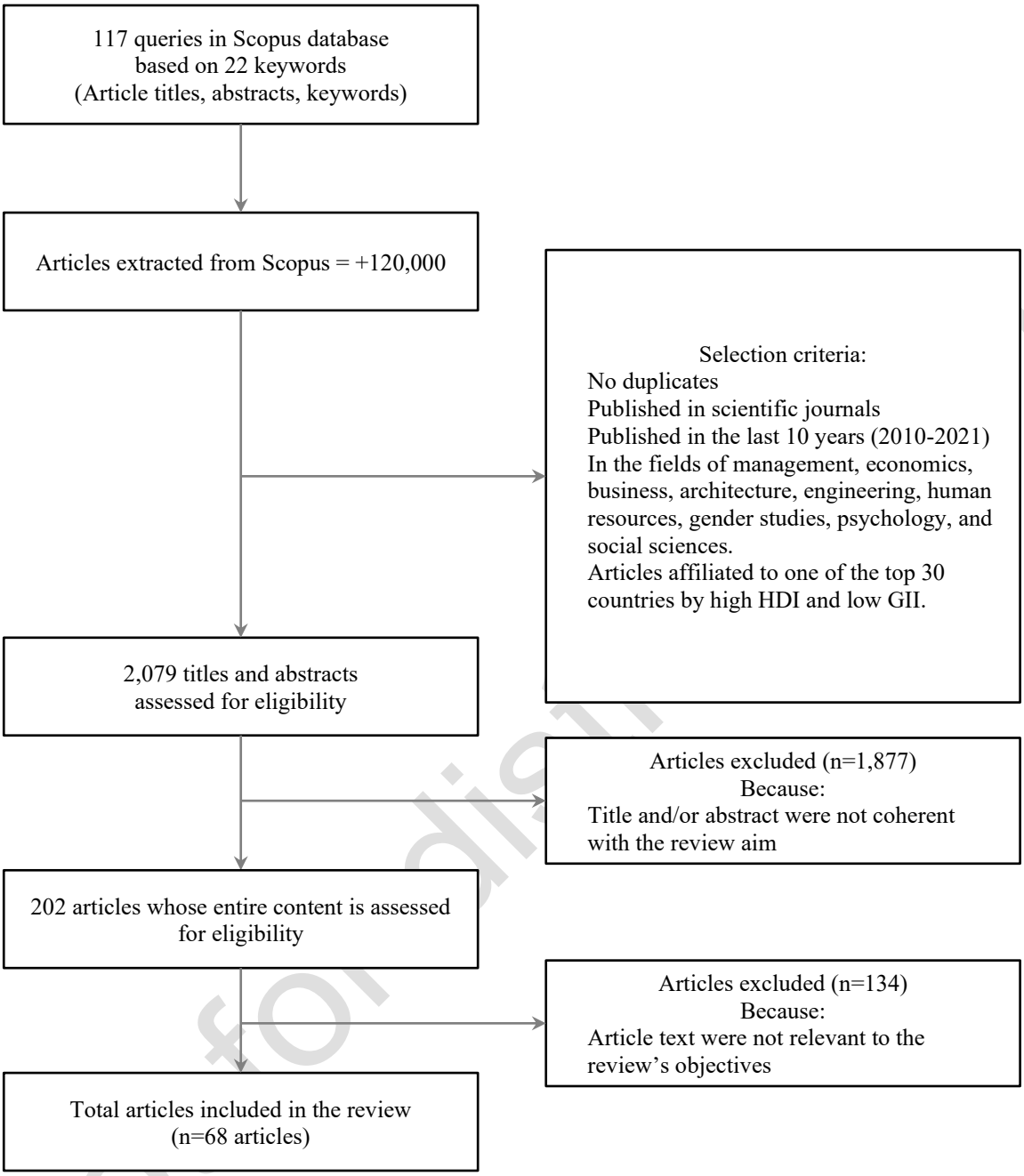

***Figure 1**: Flow diagram of the searched and included articles.*

RESULTS

Overview of the contents

After taking stock of the general features of the reviewed studies (see Appendix), the authors systematized them, relying upon a thematic framework (consisting of a matrix, see Table 1), which showcases their main themes. These themes are interpreted based on two dimensions: *workspace elements* and *consequences for women*.

The matrix columns report the *workspace elements*, which emerged as crucial spatial features leading to one (or more) consequences for women. To isolate workspace elements, the authors took inspiration from Baldry (1999), who stressed three key elements of organizational space (i) the *fixed environment*, namely the architecture of the built environment, (ii) *semi-fixed factors*, such as décor and furniture, and (iii) *ambient factors*, such as lighting and heating. Accordingly, the first spatial element in the matrix is *workspace typologies* corresponding to the *fixed environment* factor from Baldry (1999). This SLR also considers home and new working spaces emerging as new *loci* for work among workspace typologies. Therefore, *workspace typology* includes *office types (layout)*, *support spaces* ancillary to offices, *home as a workspace,* and *new working spaces*.

The second spatial element of the framework is *workspace interiors*, which capture the overall indoor experience of workers; this second element combines *semi-fixed factors* and *ambient factors* from Baldry (1999) and includes *aesthetics and ergonomics* and *indoor environmental quality (IEQ)*.

Instead*, consequences for women* are reported in the matrix rows and emerged after carefully reading the papers. Specifically, the authors categorized ten types of consequences listed in the matrix from the specific to the general ones. They include comfort, health, productivity, creativity and innovation, knowledge sharing, relationship with co-workers, job satisfaction, work-life balance, status perception, and gender equality.

Sometimes, a paper covers more than one topic; thus, it could be inserted in more than one matrix cell. However, for simplicity, this thematic framework identifies the main topics of an article and places them in the corresponding cell. Then, authors acknowledged the multiplicity of articles' issues in the discussion section. Associating each article to one cell is essential to help authors identify the research gaps and build the research agenda. Specifically, by counting the number of articles in each cell and summing up the overall number of articles by column, this SLR identifies topics that have gone under-remarked and, thus, require further inquiry.

Table 1: Thematic framework

	WORKSPACE ELEMENTS					
	Workspace typologies			***Workspace interiors***		
CONSEQUENCES FOR WOMEN	*Office types (Layout)*	*Support spaces*	*Home*	*New working spaces*	*Indoor environmental quality (IEQ)*	*Aesthetics & ergonomics*
Comfort	(Di Blasio et al., 2019)				(Almeida et al., 2020) (Bortolini et al., 2021) (Choi et al., 2010) (Choi & Yeom, 2019) (Choi & Lee, 2018) (Choi & Moon, 2017) (Frontczak et al, 2012) (Karjalainen, 2012) (Khoshbakht et al., 2018) (Kim et al., 2013) (Parkinson et al., 2017) (Rupp et al., 2019) (Sakellaris et al., 2016) (Schiavon & Altomonte, 2014) (Zhang and de Dear, 2019)	(Van der Voordt & de Boon, 2017)
Health	(Bodin Danielsson et al., 2014) (Platts et al., 2020) (Candido et al., 2020)	(Baskin et al., 2016)	(Shepherd-Banigan et al., 2015) (Limbers et al., 2020)		(Lee et al., 2017) (Nezis et al., 2019)	(Toomingas et al., 2012) (Wilkerson et al., 2018)
Productivity	(Haynes et al., 2017) (Khoshbakht et al., 2020) (De Been & Beijer, 2014)			(Bueno et al., 2018)		
Creativity and innovation				(Bean et al., 2015)		
Knowledge sharing		(Weijs-Perrée et al., 2019a)				
Relationship with co-workers	(Danielsson et al., 2015) (Morrison & Macky, 2016)	(Weijs-Perrée et al., 2019b)	(Hazak et al., 2017)	(Robelski et al., 2019)		
Job satisfaction	(Bodin Danielsson & Theorell, 2019)		(Troup and Rose, 2012)			
Work-life balance		(Bauer & Murray, 2018)	(Yates, 2011) (de Vos et al., 2017) (Fonner and Stache, 2012) (Potter, 2019) (Yildirim and Eslen-Ziya, 2020) (Yerkes et al., 2021) (Tremblay & Thomsin, 2012)			
Status perception/performativity	(Bodin Danielsson et al., 2013) (Roderick, 2016) (Kelan, 2018) (Zhang & Spicer, 2014) (Kaufmann-Buhler, 2016)	(Peteri et al., 2020)				(Stang Våland & Georg, 2018) (Wasserman, 2015) (Tyler & Cohen, 2010) (Wasserman, 2012) (Nash, 2018) (Panayiotou, 2014)
Gender equality	(Hirst & Schwabenland, 2018) (Morrison & Smollan, 2020)		(Banks & Milestone, 2010) (Munsch et al., 2014) (Patton, 2019) (Adams et al., 2012) (Burchell et al., 2020)	(Sargent et al., 2020)		
Total	**17**	**5**	**16**	**4**	**17**	**9**

Workspace typologies and gender

Office types (layout): smaller and protected is better for women

Many office types exist. This paper adheres to Bodin Danielsson et al. (2014/2019) classification, categorizing offices based on their layout.

Seventeen articles (about one-third of our sample) focus mainly on office types (layout) effects on male and female workers. This also appears in other articles as a secondary topic (*e.g.,* Wasserman, 2012); thus, it is the most discussed in the surveyed literature.

One of the most popular debates on office layout pertains to the enclosure of the space. Evidence from our search suggests that women might be more sensitive than men to enclosed private spaces. Indeed, women's satisfaction and comfort strongly depend on space for individual work and storage, single offices, and workstations near a window (Frontczak et al., 2012; Bortolini & Forcada, 2021). The other side of the coin is that open-plan offices make the workforce fully visible, enhance the opportunities for communication and collaboration, ensure flexibility in the use of the space, and bear low implementation costs (Morrison & Macky, 2017). Nevertheless, our findings show differences and similarities in the effects of open-plan offices on men and women. Specifically, as to positive effects, intense knowledge exchange emerges for both men and women (Heinzen et al., 2018). Slightly higher levels of sociability with co-workers and support from supervisors are found for women than for men in open-plan offices (Morrison & Macky, 2017).

As to the adverse effects, Haynes et al. (2017) find that both male and female workers perceive that open-plan offices negatively affect productivity because of distractions from colleagues, reduced ability to regulate social contacts with co-workers, and noise. Khoshbakht et al. (2020) find that women’s highest productivity relates to double or single offices, while for men, it relates to middle-sized open-plan offices or small shared offices. These results further support the idea that women’s dissatisfaction increases with the number of people they share space with. This is reasonable also

considering the study from Danielsson et al. (2015), who document that office type *per se* is a source of conflicts. The authors attribute workplace conflicts to noise disturbance and find that it results in more recurrent conflicts for women than for men. Along this line of reasoning, Di Blasio et al. (2019) compare open-plan and shared offices in terms of irrelevant speech noise and document that women are significantly more disturbed than men in open-plan offices, while the authors find no differences in shared offices.

One gender-related argument supporting the popularity of open-plan offices is that they mirror the *flattening of hierarchies* in modern organizations (Kaufmann-Buhler, 2016). Several studies also consider office type as a signal of status and leadership; this holds particularly true for articles that conceive space based on Marxist theories[8] (*e.g.*, gender performativity theory from Butler, 1993 and subsequent, or Lefebvre spatial theory, 1991). According to Tyler and Cohen (2010, p. 193), who refer to Butler (1993), "gender power relations are materialized in and through the spaces of organizations."

Traditionally, single offices show high status and power since these have been assigned to workers appointed to top hierarchical positions, usually men (Peteri et al., 2020). Conversely, the remainder of the "staff" – composed mainly of women – was relegated to open-plan offices, whose workstations' size and amenities were also related to hierarchy and status (Kaufmann-buhler, 2016; Panayiotou, 2014; Halford & Leonard, 2003). This might be one of the (indirect) reasons women report higher satisfaction and comfort when working in a private, enclosed space.

Nowadays, space allocation tends to be less dependent on formal hierarchy. Organizations have been adopting hot-desking policies in open-plan offices, which increases the chance of contact with many colleagues of different statuses. However, not being surrounded by the same group of colleagues daily

[8] According to Marxist theories, firms are *loci* of domination, exploitation, and alienation of workers, thus, organizational spaces are *materialized power relations* (see Kornberger & Clegg, 2004).

may hamper women's interpersonal relationships and support at work (Danielsson et al., 2015; Wells, 2000).

Also, although open-plan offices reduce spatially visible gender disparities (Kelan, 2018), such differences do persist in how women live and conceive the space (Roderick, 2016; Zhang & Spicer, 2014). On the one side, in open-plan spaces, women perceive themselves as extremely *visible* to a persistent "male gaze" (Hirst & Schwabenland, 2018, p. 170); therefore, they engage in a continuous regulation of their attitudes and their appearance (Wasserman, 2012; Wasserman & Frenkel, 2015; Morrison & Smollan, 2020; Bauer & Murray, 2018). On the other side, in open-plan offices, women – in the clerical staff – might perceive themselves as *invisible* because when working in neutral and repetitive designed open-plan offices, "they are expected not to hear conversations taking place around them that overlook their presence" (Wasserman, 2012, p. 16)

Within this stream of research, Bodin Danielsson et al. (2013) compare perceptions of the leadership of both men and women in different types of offices, showing the lowest leadership perceptions in small open-plan offices. As women are more attentive to privacy than men and are more responsive to their environment, the choice of an open-plan office can result in lower satisfaction with the indoor quality compared to their male colleagues (De Been & Beijer, 2014)

Finally, open-plan offices also affect workers' health, especially in the case of women. Bodin Danielsson et al. (2014) use sick leaves certified absenteeism as an indicator to evaluate this impact depending on the number of employees sharing the workspace. The authors show that women in open-plan offices hosting more than six people appear more inclined to take sick leaves than women in single offices. Instead, men have more sick leaves when working in offices that adopt hot-desking policies (Bodin Danielsson et al., 2014). Platts (2020) achieves similar results considering self-reported sickness absences in a sample of Swedish employees in open-plan offices. Moreover, Candido et al. (2020) – supporting earlier studies (*e.g.*, Hedge, 1984) – uncover gendered results in the relationship between office layout and health documents. The authors show higher self-reported

physical pain for women than for men in open-plan and activity-based offices, even in the case of high performative buildings[9].

Support spaces: women find restoration from male-dominated environments

Since the early 1990s, organizations have been encouraging New Ways of Working (NWW) (Aroles et al., 2019). NWW emphasize flexibility, collaboration, and communication in activity-based offices where workers are nomadic within the building and choose from the most appropriate space for the activity they have to perform (Kaufmann-Buhler, 2016). This approach entails new balances between *caves and commons*, mixing enclosed offices and collaborative spaces in the same buildings. Recent literature is interested in support spaces beyond analyzing *office types* and *layouts.* Only four studies focus explicitly on support spaces defined, in general, as informal spaces ancillary to office spaces for small and spontaneous meetings or booked meetings (Peteri et al., 2020; Bodin Danielsson & Theorell, 2019) and for shared services (*e.g.*, canteen, coffee corners or event spaces, Weijs-Perrée et al., 2019a).

The availability of support spaces in offices comes across as a mixed blessing. On the one hand, these spaces enhance opportunities for unplanned and planned interactions, which according to Peteri et al. (2020), *promise* to emancipate women. Women who can access areas for informal meetings or spontaneous serendipitous interactions may increase their productivity (Haynes et al., 2017). Overall, women are more satisfied than men with support spaces in the workplace (Bodin Danielsson & Theorell, 2019). Bauer and Murray (2018) note that such areas serve as restorative spaces where women may have friendly conversations about their private life, avoiding that those conversations, which are perceived as inappropriate in a professional realm, happen in the efficient, masculine, and ideal office space.

[9] WELL Certified buildings is a case in point (https://www.wellcertified.com/)

However, using these spaces may also challenge women because of the differences in how women and men deal with collaborative work and knowledge sharing. For instance, Weijs-Perrée et al. (2019a), studying support spaces in business centers, find that men are more likely to share *tacit* and *codified knowledge* within organizations than women. Formal teamwork is also more challenging for women than men because of "the inherent risk of conflicts that teamwork holds" (Bodin Danielsson & Theorell, 2019, p. 27). Indeed, by examining women in academia, Weijs-Perrée et al. (2019b) found that women have shorter catch-ups or chats than men, while more extended discussions involve mainly men. Reasons for such differences may be because women are more likely to share knowledge invisibly for not questioning the hierarchical structure (Hamilton, 2009) or to survive in male-dominated workplaces (Wright, 2016). Despite these differences, Weijs-Perrée et al. (2019b) find that location choices for discussions and interactions in academic buildings do not differ by gender: both men and women undertake face-to-face interactions in the same support spaces.

Of note, one article studies the effect of the location of coffee corner areas on health (Baskin et al., 2016). This work finds that women are less likely than men to increase their consumption of unhealthy food when coffee corner areas are closer to their workstations.

Finally, the materials and furniture of support spaces are relevant for gender equality. The critical feminist lens adopted by Peteri et al. (2020) observes that materials and furniture in modern-designed support spaces and relaxation areas primarily target "youthful bodies with playful states of mind" (p. 12, op. cit.), who are generally young men. Accordingly, women may feel unfitted with the archetype of the ideal worker.

Home as a workspace: still a women's stigma in multipurpose houses

The idea of the home as a workspace both for men and women has a very long-lasting tradition (*e.g.*, O' Mara, 1999). Amid its historical evolution, working from home (WFH) has an enduring gendered connotation, as reported in 16 reviewed articles. Taking inspiration from a Marxist lens, Patton (2019)

explains that in American middle-class families in the post-war period, the *city* – intended as the business center – was considered the masculine working place, while the house in suburban neighbors was the "feminine world of privacy" (p. 527, op. cit.). Technologies and tools that in that period started to be available at affordable prices (*e.g.*, telephone, typewriter) enabled workers – especially women – to work from home. From that point in time to today, WFH has been (explicitly or implicitly) *stigmatized* (*i.e.,* devalued) as a *feminine* practice (Munsch et al., 2014; Johnson et al., 2007). Specifically, co-workers may question the leadership of women working from home, considering them less productive and less focused on their tasks (Munsch et al., 2014). In other words, women who choose WFH in favor of their household duties are *stigmatized* as they do not correspond to the ideal workers' archetype (Adams et al., 2012). Consequently, women engaging in WFH tend to work harder and longer than their office-based colleagues as they feel guilty about the *privilege* of this working condition (Chung & Van Der Horst, 2018).

Nowadays, WFH is primarily virtual work enabled by information and communication technologies (Tremblay & Thomsin, 2012; Yates, 2011). Fonner and Stache (2012) and Hazak et al. (2017) report that women are slightly more likely than men to be involved in WFH, whereas men are more likely than women to be involved in flexible or mobile work arrangements. Similarly, Burchell et al. (2020) and Tremblay & Thomsin (2012) find that women are considerably more likely than men to be compelled to work mainly at the employer's premises, while men tend to move more across multiple locations. Hazak et al. (2017) note that this may relate to the higher bargaining power of men in negotiating their work schedules (*e.g.*, Kolb & McGinn, 2009).

During the COVID-19 pandemic, things did not change much. According to Yerkes et al. (2021), fathers, despite being allowed to WFH, have been more likely to work in their traditional workspace than mothers, who have worked more from home.

Beyond the gendered access to WFH, Adams et al. (2012) and Troup and Rose (2012) focus on the effect of WFH on gender equality and job satisfaction. They observe that claims of women's

discrimination are less likely when organizations design *formal* WFH policies[10]. However, these policies also tend to legitimize women's heavy burden in childcare and household duties. Instead, informal WFH positively affects women's job satisfaction (Troup & Rose, 2012). Specifically, the authors show that with informal WFH, women tend to find a more satisfying childcare distribution with their partners than with formal WFH.

Many studies on WFH focus on its effects on women's work-life balance. On the one hand, WFH drastically reduces women's contact with colleagues and, thus, nurtures their feeling of being excluded from the social life unfolding in the workspace (Tremblay & Thomsin, 2012), especially if they resort to WFH for extended periods (Yerkes et al., 2021). Women may experience blurring boundaries between work and family life (Yildirim and Eslen-Ziya, 2020), thus reflecting upon whether they need to *integrate* or *segment* their identities as workers or family members through the use of time, space, and objects when working from home (Ashforth et al., 2000). Indeed, Fonner and Stache (2012) focus on how male and female workers manage the boundaries between private life and work when engaging in WFH. Interestingly, women use space as a *boundary cue* (Ashforth et al., 2000) to shift from their work role to their family role slightly more than men, since for women, demarcation of house spaces between private life and work life is generally more challenging than for men (Richardson & McKenna, 2013; Laegran, 2008). In other words, women resort to dedicated or off-limits spaces to define their identity as workers while *segmenting* it from their different personal identities - *e.g.*, mothers, wives (Bain, 2004).

On the other hand, WFH engenders positive effects on women. It allows women who face heavy family duties (*e.g.*, childcare or caregiving for elderly relatives, to access the labor market or remain attached to the workforce (Chung & Van Der Horst, 2017). That is why the possibility of WFH is a

[10] *Formal WFH* consists in a contract that specifies days and time when workers are allowed to WFH. *Informal WFH* is negotiated with supervisors or management based on workers' daily needs.

crucial factor for women choosing certain types of jobs (*e.g.*, remaining in academia, working in creative industries, Banks & Milestone, 2010) or for accepting longer commutes to work (De Vos et al., 2018).

Finally, two reviewed articles find that WFH may positively influence women's health. Shepherd-Banigan et al. (2015) envisage difficulties balancing work and family for WFH mothers, which may lead to depression; however, data do not support their conjectures; instead, they show that WFH lowers depressive symptoms. Limbers et al. (2020) studied the quality of life of WFH mothers during the COVID-19 pandemic, finding that physical activity (*e.g.*, walking, bicycling, aerobics, etc.) positively moderates the workers' satisfaction with the home space.

For what concerns in more detail the spatial arrangements of homes as a workspace, when combining work and private life at home, women design a *multi-purpose space* inside their houses. As Potter (2019) noted, this space focuses on women doing commercial businesses from home in the 1950s varies when women changed the rooms they used for work during the day (*e.g.*, the bedroom, the kitchen, the living room).

Overall, the 16 reviewed articles address WFH as a work organization practice at large, focusing on the effects that this work practice has on women rather than on *how* to design and use the home space to support WFH in the logic of empowering gender equality (see future research direction on the topic in the discussion section).

New working spaces: when accessible to women, offer a non-hierarchical atmosphere

NWW, which enables flexibility across time and space (Aroles et al., 2019), has also given popularity to the *new working spaces*. These include coworking spaces, maker spaces, collaborative spaces, and other third spaces (Oldenburg, 1989), in addition to the home (the first space) and the office (second space). These spaces have progressively become the preferred workspaces for entrepreneurs, freelancers (Sargent et al., 2020), or remote-compatible workers, who do not like WFH (as recently

reported by Rodríguez-Modroño, 2021). The distinctive feature of these spaces is that they enable people to "work alone together" while supporting community-oriented activities (Spinuzzi, 2012, p. 433). Especially during the current pandemic, third spaces have gained momentum because they provide a valid, fully served alternative to the isolation of WFH while preventing long commuting to reach the traditional office (Mariotti et al., 2021). Based on the abovementioned evidence from the literature, which recalls the need of women for workspaces that are protected but at the same time encourage chance encounters, these spaces might prove ideal for women workers. Nevertheless, only four studies out of 68 analyze the different effects of *new working spaces* on women and men. Three of these articles directly address the topic of women's inclusion. Also, new working spaces may entail both positive and negative effects on women.

Sargent et al. (2020) argue that usual workplace control mechanisms tend to be weak in coworking spaces. The authors also find that space design seems crucial to reducing gender disparities. Unlike traditional workspaces, where mainstream organizational approaches often favor gender spatial segregation (see the discussion in the first paragraph of this section), the open-plan design of coworking spaces enables men and women to interact regularly in a non-hierarchical environment, encouraged by shared open areas and workstations. The interactions enabled by design and space allocation may also have positive consequences in sharing business practices, collaborations, and alleged career advancements.

However, access to new working spaces risks being unequal. On the one hand, the prices of co-working spaces do have consequences (Sargent et al., 2020). The same authors observed that *segregation* manifests when coworking spaces charge high fees for accessing *dedicated* teamwork areas. Men, who usually hold high-paid jobs, are more likely than women to access these dedicated areas. Therefore, men interact more with men in these areas because women tend to occupy less costly open spaces. Coworking spaces with more equitable pricing policies seem to promote gender diversity better.

On the other hand, the type of new working space itself might induce a 'natural selection' in the access. Bean et al. (2015) study *maker spaces*. These are *new working spaces* targeted to *makers* (Anderson, 2012), namely professional creators operating with cutting-edge technologies (*e.g.*, deep tech entrepreneurs and radical innovators). As these workers are mainly in Science, Technology, Engineering, and Mathematical professions (STEM), the authors associate the scarcity of women in maker spaces with their low presence in STEM[11]. The study also identifies the appearance of maker spaces, which are often loud, messy, and male-dominated, as another barrier that renders them less appealing for new female members.

Finally, Bueno (2018) explores productivity in coworking spaces and finds a positive relationship between working in a coworking space and productivity for men, but not for women. In line with these results, Robelski et al. (2019) find that women suffer more interruptions in coworking spaces than men; instead, they find no statistically significant differences between men and women regarding space satisfaction and health when working in such spaces.

Workspace interiors and gender

Aesthetics and ergonomics: workspaces tend to be designed for men

Among physical characteristics of the workspace interiors, *aesthetics and ergonomics* are rather recurrent topics. The term aesthetics refers to colors, lighting, and materials used for the interior design and furniture of the workspaces. Frequently, men's offices carry uniform masculine aesthetics, with monochromatic color schemes and images of power (Wasserman & Frenkel, 2015; Wasserman, 2012), whereas women's workspaces are depicted as colorful and homey (Panayiotou, 2014). Along

[11] For instance, in 2016 OECD data show that women count for only 15% of new entrants in engineering programmes. Source: OECD (2016), *Education at a Glance 2016: OECD Indicators*, OECD Publishing, Paris, https://doi.org/10.1787/eag-2016-en

this line of reasoning, both Van der Voordt and de Boon (2017) and Parkinson et al. (2017) find that preferences for offices' colors correlate with gender. Their studies document that, in general, both men and women prefer white offices and meeting rooms, but women feel more comfortable than men with more colorful offices.

However, the corporate spatial aesthetics may imply gendered metaphors. For instance, Peteri et al. (2020) – through a feminist lens – put into question corporate practices, which forbid workers to personalize and decorate their workspace or move furniture around the room. The authors attribute these practices to cultural imperatives, which associate homey and decorated offices with the *feminine* domestic sphere, thus not fitting the uniform *masculine* aesthetics of a corporation. Through this lens, the authors argue that women may feel excluded from the so-called *old boys' club*. Glass walls are another case in point. While top management usually prefers meeting rooms and offices with glass walls to convey the image of an open and transparent organization, this choice can cause a feeling of control (Wasserman, 2012) and hamper confidentiality, especially among female workers (Stang Våland & Georg, 2018). Stretching this concept, Wasserman (2012) and Peteri et al. (2020) observe that the famous *glass ceiling* concept (Adams & Funk, 2012) is subtly evocated when clerical personnel (usually women) are confined behind glass walls.

Two articles dive into gender and the ergonomics of the workstation. Specifically, Toomingas et al. (2012) study reveals that female workers – in that specific case, programmers – spend longer uninterrupted seated time in the same posture than their male colleagues (11% versus 4.6% of the recorded time). Wilkerson et al. (2018) also document gendered sedentary behaviors, with women being, on average, less active than men, especially the highly educated ones who hold white-collar jobs. Furthermore, Wilkerson et al. (2018) conclude that designers should provide connectivity paths to reduce women's sedentary habits that encourage them to move across workstations in open-plan offices or, outside the workspace, towards shared public spaces for work or relaxation.

Finally, feminist literature also criticizes workstations and seats. Several authors remark that these are standardized for a homogeneous worker (usually a Caucasian, middle-aged man), while workers with different body types (*e.g.*, tall or fat people) or with other clothing (*e.g.,* women) likely experience the same spaces as less comfortable (Peteri et al., 2020; Wasserman, 2012).

Indoor Environmental Quality (IEQ): still insufficient for women

IEQ is the interior condition of a building in terms of thermal comfort, lighting, indoor air quality, and acoustics. Sixteen articles in the surveyed literature address workspace IEQ and its effects on workers. Many studies show that IEQ factors deeply affect women's comfort and satisfaction within the workspace. Specifically, women seem to be highly dissatisfied with most IEQ factors (Ne'eman et al., 1984; Schiavon & Altomonte, 2014).

In a workspace with the same temperature, women feel more uncomfortable than men (De Been & Beijer, 2014; Karjalainen, 2012; Schiavon & Altomonte, 2014; Rupp et al., 2019). For instance, men tend to perceive the same thermal environment as warmer than women, even controlling for environmental, contextual, and other demographic factors (Choi et al., 2010; De Been & Beijer, 2014; Karjalainen, 2012; Choi and Yeom, 2019; Zhang and de Dear, 2019). Bortolini and Forcada (2021) attribute the causes of these perceived thermal differences to occupational characteristics (job stress, low job pride) and individual features (*e.g.*, fitness, nutritional differences, ethnicity, culture, and social class).

In addition, Karjalainen (2012) agrees with Parkinson et al. (2017) that women, on average, need more control over temperature. Recently, the issue became critical, as workers in open-plan and shared offices have fewer possibilities to set their preferred thermal conditions.

The diffusion of open and shared offices has raised another IEQ-related issue: noise. Studies show that noise decisively impacts job satisfaction and the health of female workers (Frontczak et al., 2012). Although the perception of noise is subjective and hard to measure (Frontczak et al., 2012),

Kim et al. (2013) find that in open-plan offices, women are less satisfied than men with the level of noise and sound privacy. For women, noise privacy has the worst rating among the 15 IEQ variables that Bodin Danielsson et al. (2015) consider in their study. It crates conflicts due to noise disturbance (Danielsson, 2015).

Finally, Choi and Moon (2017) analyze a complete set of IEQ factors by considering 411 workstations located in 14 buildings (commercial and university buildings) in Southern California. Their results show different IEQ preferences between men and women also depending on their age and workstation location inside the office. According to their analysis, lighting levels and air velocity are those crucial factors that differentiate female and male workers of different ages.

Finally, within this literature, only two articles relate IEQ satisfaction with women's health (Lee et al., 2017; Nezis et al., 2019). Lee et al. (2017) find that women, although working in the same IEQ conditions, report much higher subjective scores than men on sick building syndrome (*e.g.,* eye, nose, throat, skin irritations, and headache) and on musculoskeletal disorder symptoms (*e.g.,* only in terms of hand/wrist/finger pain). However, working in the same IEQ conditions report much higher subjective scores than men on sick building syndrome (*i.e.*, eye, nose, throat, skin irritations, and headache) and on musculoskeletal disorder symptoms (*i.e.,* only in hand/wrist/finger pain). Nezis et al. (2019) associate similar results on women's sick building syndrome symptoms to the *particulate matter* of indoor air (*i.e.,* air pollution).

An overview of the most relevant theories and methodologies

This paper delves into the most relevant theories and methodologies mentioned and/or adopted in the reviewed papers. It is noteworthy that 31 out of 68 reviewed articles (46%) put gender at the core of their investigation, whereas 37 articles (54%) considered gender one of the dimensions/variables under inquiry.

Theories

Regarding theories, 40 articles over 68 (59%) did not explicitly adopt any specific theoretical lens to interpret their results but primarily based their conceptualization on prior studies on broad theoretical positionings. Instead, the remaining 28 papers (41%) applied multiple theoretical lenses from different disciplines, which speaks in favor of interdisciplinarity of the theme. As a general overview, 13 articles whose core topic is gender relied on one (or more) *gender-related theories*, while seven articles focusing more explicitly on space relied on one or more *space-related theories*. Unsurprisingly, the core topic of the article drove the choice of the theoretical domain. Of note, two articles (Peteri et al., 2021; Hirst & Schwabenand, 2018) referred to *gender-related* and *space-related* theories. Finally, six articles relied on neither spatial nor gender-related theories.

The theoretical lens adopted to read the results helps the authors of the reviewed papers interpret their results. Inconsistent results or different interpretations of similar empirical results emerged in the reviewed articles. Indeed, theories mainly delve into how personal and socio-cultural characteristics lead to a different *perception* of the space; gender-related theories, instead, consider genders as the results of socio-cultural development.

For brevity, only the most recurrent theories are discussed in this section. In contrast, the others are left out since they mainly refer to other fields of study (*e.g.*, Lewin's field theory) or take a particular perspective on gender issues (*e.g.*, Feminist theories). However, the following table reports the complete set of space-related and gender-related theories adopted and/or mentioned by the reviewed papers (Table 2).

As to space-related theories, the *spatial triad* from Lefebvre (1991) played a central role, being cited by seven articles out of 30 (*e.g.*, Peteri et al., 2020; Hirst & Schwabenland, 2018). Papers referred to this theory to discuss whether and how women (compared to men) feel tensions and contradictions amongst the following three spatial dimensions: (i) how architects and managers *conceive* workspace with gendered meanings (*e.g.*, through spatially visible gendered hierarchies), (ii) how women

instrumentally *perceive* their workspace (*e.g.*, through their everyday activity), and (iii) how women *live* their workspace by expressing their identity through it (*e.g.*, by personalizing their workstations). Organization scholars (*e.g.*, Dale and Burrell, 2008; Kornberger & Clegg; 2004) further developed Lefebvre's (1991) spatial theory by drawing on the *sociomateriality* theory of Orlikowski (2008) and Latour's actor-network theory (2005). Nine of the reviewed articles cited the concept of *organizational spaces* by considering the workspace as profoundly connected to a social and symbolic dimension, which affects workers' identity.

As to gender-related theories, eight articles referred to *gender performativity theory* by Butler (2004). Drawing on Butler (2004), Gregson, and Rose (2000) postulated the gender spatial performativity theory. According to this theory, workers *perform* or *do* their gender (West & Zimmerman, 1987) by socially constructing the space where they live and work and being constructed by this space. This means that women do performative acts in the workspace according to what the others (e.g., colleagues, corporate leaders, and society at large) view as appropriate.

Another relevant perspective is the *critical gender theory* by Acker (1990; 2006) and West and Zimmerman (1987). This theory proposed a framework to study organizations as gendered *loci* wherein men's privileges are built into job design, allocation of power, rewards, and resources, behavioral rules, and into – what explicitly concerns the theme of this review – design of the workspace.

It is noteworthy to cite *social role theory* (Eagly, 1987; Eagly & Wood, 1991) rooted in the gendered division of labor conceptualized by Becker (1985). Specifically, at home, men are the breadwinners and women are the homemakers, while at work, women have lower wages and lower hierarchical levels than men. This uneven division of labor has forged behavioral norms and expectations for people based on their socially identifiable gender. These norms mirror the workspace, where women are expected not to question *segregated workstations* and men are prized with more comfortable facilities (*e.g.,* Kaufmann-Buhler, 2016).

Methods

Regarding research methods, 38 articles out of 68 (56%) used survey data; some were large-scale surveys (*e.g.*, Schiavon & Altomonte, 2014; Zhang & de Dear, 2019), whose samples exceeded 15,000 observations. Seven of these studies analyzed data only through descriptive statistics and basic correlations (*e.g.*, Almeida et al., 2020; Morrison & Macky, 2017; Choi et al., 2010; Bortolini & Forcada, 2021; van der Voordt et al., 2017; Tremblay & Thomsin, 2012; Haynes et al., 2017). Instead, 19 studies resorted to econometric analyses (e.g., Adams, 2012), including cross-sectional models (*e.g.*, Wilrkenson et al., 2018; Di Blasio et al., 2019; Robelski et al., 2019; Yerkes et al., 2020) or panel data (*e.g.*, de Vos et al., 2018). Finally, four studies, namely Choi & Lee (2018), Choi & Moon (2017); Sargent et al. (2020); Turesky & Warner (2020), considered survey data but within a mixed-method approach combining quantitative and qualitative analyses.

Twenty-three articles (34%) rely on qualitative methodologies. Specifically, some works resorted to interviews (*e.g.*, Fonner & Stache, 2012; Yates, 2011) or focus groups (*e.g.*, Bean et al., 2015; Tyler and Cohen, 2010), while others relied on a single case study (*e.g.*, Wasserman and Frenkel, 2015), 4 are ethnographic studies (Baskin et al., 2016; Peteri et al., 2021; Hirst et al., 2018; Stang Våland & Georg, 2018). Finally, 3 are critical theoretical studies (Kaufmann-Buhler, 2016; Patton, 2019; Banks & Milestone, 2011), 3 are literature reviews (Nezis et al., 2019; Karjalanen, 2012; Kelan, 2017), and one is a film review (Panayiotou, A., 2014).

Table 2: Overview of the theories adopted and/or mentioned in the reviewed papers.

Gender-related theories	**# of articles**	**Space-related theories**	**# of articles**
Post-structuralist theories: Gender performativity theory (Butler, 1990; 1993; 2004); *Do gender* concept (West & Zimmerman,1987)	Referring to these theories: 4 articles Combining these theories with others: 1 article	Lefebvre spatial triad (Lefebvre, 1974/1991)	Referring to this theory: 1 article Combining this theory with others: 5 articles

	The overall number of articles citing† these theories: 8 articles.		The overall number of articles citing this theory: 8 articles
Critical gender theory (Acker, 1990; 2006; Williams, 2000).	Referring only to these theories: 3 articles Combining these theories with others: 1 article The overall number of articles citing these theories: 6 articles.	Sociomateriality theory (Orlikowski, 2008); Actor-network theory (Latour, 2005); Organizational spaces perspectives (Elsbach & Pratt, 2007; Dale & Burrell, 2008; Kornberger & Clegg; 2004; Beyes & Steyaert, 2011).	Referring only to these theories: 3 Combining these theories with others: 2 The overall number of articles citing these theories: 9 articles.
Social role theory (Eagly, 1987; Eagly & Wood, 1991); Role congruity theory (Bosak et al., 2012); Expectation states theory (Berger et al., 1974); The sexual division of labor (Becker, 1985); Gendered labor market (Adkins, 1999).	Referring only to these theories: 1 article Combining these theories with others: 2 articles The overall number of articles citing these theories: 8 articles.	Gender spatial performativity (Gregson & Rose, 2000)	Combining this theory with others: 3 articles
Feminist theories (Grosz, 1994); Feminist geography theory (Ardener, 1993); Feminist planning theory (Hendler, 2005).	Referring only to these theories: 1 article Combining these theories with others: 2 articles The overall number of articles citing these theories: 5 articles.	Lewin's field theory (Lewin, 1942)	Combining this theory with others: 1 article
Gender identity theory (McDowell, 1999 and subsequent) Work-home boundary theory (Ashforth et al., 2000)	Referring only to these theories: 2 articles The overall number of articles citing these theories: 5 articles.		
The managed heart theory (Hochschild, 1983; 1989)	Combining these theories with others: 2 articles The overall number of articles citing these theories: 4 articles.		

† Citing articles cite the seminal theoretical papers, but not all adopt the theory to interpret their results or as an interpretative framework.

DISCUSSION AND CONCLUSION

This study undertakes an SLR on workspace and gender. It systematizes the knowledge base from studies published between 2010 and 2021, investigating whether and how the workspace influences female workers and, more generally, gender equality. This is the first SRL on this theme to the best of the authors' knowledge. It contributes to academic knowledge by identifying disciplinary areas, topics, theoretical approaches, and methodologies on women and workspaces. In this section, authors identify crucial research gaps, which open avenues for future research and call for advancements in topics, theories, and methodologies. The paper concludes by outlining several managerial and policy implications.

Call for new topics

Levering the thematic framework (Table 1), this SRL highlights that recent literature on workspace and gender has focused on recurrent topics. Overall, needs and preferences emerge over the outcomes (*e.g.*, creativity, productivity) related to different workspace arrangements or characteristics generated. Overall, authors believe that research should focus on how workspace design could enable men and women to create satisfactory outcomes at work. Several studies underpin the relevance of space, but still little empirical research has focused on this issue.

Among *workspace typologies*, several studies on *office types (layout)* analyze how open-plan offices influence women's status perception or physical comfort. Future research should explore how different office layouts influence work outcomes (*e.g.*., productivity or innovation and creativity) of male and female workers. *Support spaces* (*e.g.*, meeting rooms, canteen, break-out rooms) are often designed for the *ideal type of worker* (Peteri, 2020), namely a Caucasian middle-aged man. An in-depth discussion on how they influence women is still missing; authors believe future research should

deepen this topic. For instance, whether and how support spaces favor women's creativity, job satisfaction, and, ultimately, their productivity? How do they help them in managing their work-life balance? Current studies address the *home* more as an alternative to the office than as a workspace that needs specific spatial requirements and facilities. While several researchers have widely discussed WFH and its relations with work-life balance, scholarly conversations generally neglect the effects of specific spatial arrangements of the house (*e.g.*, working in a dedicated room) on women's work outcomes and relationships with colleagues. Authors call for further research on these aspects.

In addition, the few contributions to *new working spaces* (*e.g.*, co-working spaces or maker spaces) mainly focus on women's work outcomes (*e.g.,* productivity), while little is known about the alleged relations between these workspaces and women's status. For instance, do women working in coworking spaces suffer a *stigma* similar to that of women working from home? Furthermore, do the provision of care services and the informal organizational logic that coworking brings positively affect women's productivity? This SLR also finds no evidence of how *new working spaces* can support women's work-life balance, comfort, and health; authors welcome future contributions on these topics.

Finally, today's scholars concur that workspaces are evolving, and their borders are blurring (Nash, 2018, considers the whole city as a workplace). A multiplicity of workspaces enriches workers' experiences beyond work. Along this line of reasoning, authors encourage future research on how this network of spaces can improve work-life balance, comfort, and satisfaction, especially for women.

As for *workspace interiors*, the most discussed topic is IEQ. Although the preferences of women and men for IEQ have been extensively studied, the effects of IEQ on work outcomes remain unclear. Moreover, the reviewed literature shows that ergonomics and aesthetics make women feel at ease, despite often relating to a masculine image of the corporate identity. However, still little is known.

For instance, do colors, materials, and furniture improve women's productivity, creativity, and knowledge sharing with co-workers? How do workstation design and location affect women's relationships with their co-workers? Which characteristics mark an *inclusive* corporate aesthetics?

Call for theoretical and methodological advancements

As discussed in the results section, the literature on workspace and gender combines various theoretical lenses and champions diverse ideological approaches. Currently, this fragmentation is so strong that even the notions of *space* and *gender* are blurring. Accordingly, the authors encourage scholars to reconcile – when and if possible – their diverse perspectives to develop a coherent knowledge base.

Moreover, the current literature generally overlooks the notion of *intersectionality*, *i.e.*, how dimensions of diversity beyond gender, such as race, ethnicity, age, and social class, interact to cause exclusion and power imbalances (Acker, 2006). Indeed, a sizable portion of the reviewed studies consider *gender in isolation*, disregarding its possible interactions with other diversity dimensions; this gap is especially evident in articles that adopt a Marxist lens (*e.g.*, Peteri et al., 2020). These works mainly examine conflicts and contradictions between men and women to show the gender dichotomy *per se* and disregard that other diversity dimensions (*e.g.*, sexual orientation, disabilities, culture, socioeconomic origins, etc.) may play a role and provide a strong contribution to DE&I policies' development.

Considering how spatial elements interact with a combination of two or more diversity dimensions may shed new light on the phenomena under investigation. Therefore, it would be interesting to examine how differences in job positions mirror different workspaces' occupation. In a similar vein, future studies on this theme should consider the (moderating and mediating effects) of key factors at the *micro-level of the individual* (*e.g.*, psychological traits), *meso-level of the organizations* (*e.g.,* the

corporate hierarchy of women's firms or the structure of their family) and the *macro-level* of the entire socio-cultural system (*e.g.*, countries, legal framework, norms and beliefs on gender equality). Finally, scholars should not see space merely as a "frame" or "container" for *lived* experience but also as an enabler for *social* experience (*à la* Lefebvre, 1991, p.26).

While the reviewed articles cover multiple disciplines (see Figure B and Table D in the Appendix), an interdisciplinary approach is still missing. Indeed, the relation between workspace and gender has *many facets,* and, in recent years, it has been challenged by the (rapid) evolution of workspaces and gender roles. All these aspects bring complexity, which calls for an interdisciplinary approach. On the one hand, scholars from different disciplines should collaborate so that they can offer fresh perspectives and decisively advance current knowledge. On the other, publishers and editors should enlarge the disciplinary boundaries of their journals to welcome interdisciplinary contributions that still encounter challenges in finding appropriate outlets.

Enhancing interdisciplinarity undoubtedly requires methodological advancements, which are also crucial *per se*. First, most empirical articles use small cross-sectional datasets (*e.g.,* Choi & Moon, 2017; Weijs-Perrée et al., 2019b). The literature lacks studies based on large datasets, which can provide more solid and generalizable results. For example, in the sampled papers, databases tended to regard the same country of the institution where the first author was based. This evidence highlights that a cross-country and cross-cultural approach is still missing. It will be interesting to expand the geographical borders of this literature review to verify if comparative studies are more common in countries with lower HDI and higher GII. Likewise, studies based on data incorporating the temporal dimension (longitudinal study) are welcome. Indeed, longitudinal datasets enable one grasping temporal trends and applying econometric techniques, which unearth casual-effect relations in the phenomena under investigation (*e.g.,* adoption of open-plan offices and changes in female workers' performance). However, longitudinal data may suffer from *unobserved heterogeneity* (*e.g.*, Heckman & Borjas, 1980). In these cases, exogenous shocks act as natural experiments that contribute to

solving technical problems. The COVID-19 pandemic is a case in point, and authors thus encourage research relying on both pre- and post-pandemic data.

Still, the potential of hypothesis testing should not be overestimated. It has been recently noted that such an approach risks being just a *quest* for asterisks, meaning that significant relations found in the econometric analysis push scholars to *tune* their hypotheses *ex-post* (Bettis, 2012). Instead, *better statistical practices* (p. 112, op. cit.) in hypothesis testing (*e.g.*, replication) may help solve the problem. Likewise, qualitative and grounded theory studies could improve theory development.

Finally, only two literature review articles (Munsch et al., 2014; Choi & Yeom, 2019) resort to an experimental method. Scholars are encouraged to adopt experimental design (Bono and McNamara, 2011) to rigorously address *questions of causality* in this realm, *e.g.*, how space dimensions cause different effects on male and female workers.

Managerial and policy implications

This paper offers valuable insights to a range of relevant stakeholders.

First, professionals involved in space design (*e.g.*, architects, engineers, and workplace strategists), in line with Khoshbakht (2020), should adopt a *human-centered approach* without assuming *a priori* that all space users have the same perception of their workspaces.

Indeed, by collaborating with HR, CSR, and DE&I managers, designers can gather relevant knowledge about their business clients to inform their projects. Designers should spatially translate into their projects not just the firm's image that the management wants to convey but also reflect that their design decisions could differently affect women and men (Table 3) and, ultimately, firms' performances. In addition, consultancy firms (*e.g.*, Great Place to Work[12]) certifying good work

[12] For further information see: www.greatplacetowork.com

practices in organizations should include workspace design among their ranking criteria to increase firms' and workers' awareness of the relevance of this topic.

Table 3. Recommendations for gender-inclusive workspace design

Workspace Elements	*Crucial factors of workspace design for women's satisfaction*
Office types (layout)	- Space for individual work/Access to single offices (more important for women than for men) - Workstations' positions (preferably near a window for women)
Support spaces	- Informal spaces (coffee corners, breakout rooms) are restorative spaces mainly for women - Aesthetic and interior design should be fitted to an inclusive aesthetics (not masculine oriented) - Allow ancillary offices for individual work/small meetings in open-plan offices (women are more uncomfortable than men in open-plan offices).
Home as a workspace	For housing design: - Availability of off-limits spaces at home is essential for women (more than for men) - Flexibility of multiple rooms of the house to host work is required (both for men and women)
New working spaces	- Non-hierarchical space design favors both women and men - Accessible space for individual work (preferably without fee distinctions), especially for women. - Aesthetic and interior design should be fitted to an inclusive aesthetics (not masculine oriented)
Aesthetics and ergonomics	- Colors of offices and meeting rooms matter (especially for women). - Being women more sedentary than men, the study of workstation location and interior paths (*i.e.*, between workstations, between workstations and meeting rooms or breakout rooms, towards outdoor spaces) matter for health, and it also benefits men - Workstations and seats might consider different body types. - Universal masculine aesthetics may render workspaces less appealing to women than to men.
Indoor Environmental Quality	- Women appreciate the possibility of controlling the temperature of office spaces (This is less relevant for men) - High attention to noise and privacy concerns (especially for women) - High attention to indoor air quality (especially for women).

Second, corporate personnel (*e.g.*, top executives, managers in charge of human resources (HR), facility management (FM), workplace management (WPM), corporate social responsibility (CSR), and diversity, equality, and inclusion (DE&I) managers; will hopefully become more attentive to including information about male and female workers' satisfaction and experience with the workspaces in their reports. The information encapsulated in this research piece can support firms' leadership to embrace inclusive practices when designing their workspaces. To enhance these practices, managers should actively engage in workspaces' design and monitoring process through an intense exchange of information with architects and facility managers, especially in verifying the outcomes of specific workspace solutions.

Third, policymakers (*e.g.*, mayors and councilors in urban and city planning) should collaborate with firms and designers to understand how to enrich workers' spatial experiences. Policymakers should invest in the provision of public spaces (*e.g.*, public libraries or coworking spaces and facilities that can support women's work-life balance (Kojo & Nenonen, 2014). Finally, as Johnson (1999) early noted, policymakers and firms should engage in conversations on the location of firms' headquarters and satellite offices with the common aim of nurturing a positive relationship between these buildings and the urban space. Such relationships may have implications for the well-being and safety of female workers and citizens (Beebeejaun, 2009).

Given its multifaced and multidisciplinary nature, the call for designing inclusive workspaces requires the collaboration of many figures and roles.

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DECLARATION OF INTEREST

The authors report there are no competing interests to declare

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APPENDICES

Descriptive characteristics of the selected articles

The next figure reports the distribution of the articles by publication year (from 2010 to 20th April 2021), showing an increasing trend in the number of published articles over time. It is noteworthy that there has been a peak of articles published in 2018. The reasons behind this peak may be twofold. First, the peak may relate to the growth of the "Me Too"[13] movement that increased the interest and awareness on gender issues. Second, it may be associated with the declaration of gender equality as a Sustainable Development Goal for the year 2030 by the European Union, namely *Goal 5: Achieve gender equality and empower all women and girls*[14]. A prior interesting peak was in 2012. This is in line with publications on the theme (*e.g.*, Sinocropi & Cortese, 2020), which state that around this period diversity of the workforce was gaining importance in business contexts.

From 2018 onwards, the theme has gained popularity and relevance and, accordingly, it emerges a steady increase of the scientific production on the theme[15].

[13] For further information: https://metoomvmt.org/

[14] For further information see: https://www.un.org/sustainabledevelopment/gender-equality/

[15] The authors expect a peak in 2021 due to large debate on the negative effects of the Covid-19 pandemic on women. However, queries were run in April 2021 and thus the graph does not show this peak.

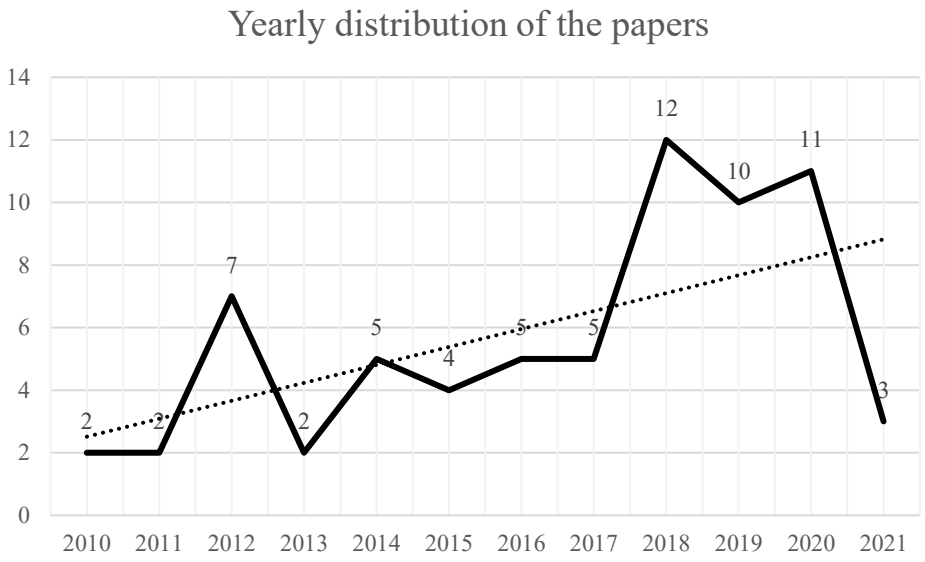

Figure A: Yearly distribution of the articles

The following table shows the geographical distribution of the articles, based on the affiliation of the first author. Among the selected countries, 54% of the articles come from the USA, the UK and Australia. Clearly, Anglo-Saxon countries, such as the USA and UK (19 and 9 articles, respectively) perceived this issue as highly relevant, followed by Australia (with 9 articles). This is not surprising when considering that the above-mentioned countries have led research in both organization and workplace management for the past 20 years or so.

As to Europe, the topic is mostly discussed by scholars working in the Netherlands and Sweden. This it is not surprising: the two countries rank in the top-five of those with the lowest GII[16] and the Netherlands leads research in workspace design.

[16] The top-five countries are Switzerland (0.025), Denmark (0.038), Sweden (0.039), the Netherlands (0.043), and Belgium (0.043)

Table A: Geographical distribution of reviewed articles

Country	# of articles	%
USA	19	28%
UK	9	13%
Australia	9	13%
Netherlands	6	9%
Sweden	6	9%
Others[†]	19	28%
TOTAL	68	
[†] **Canada (3); Finland (2); Greece (2); Israel (2); New Zeland (2); Spain (2); Cyprus (1); Denmark (1); Estonia (1); Germany (1); Italy (1); Norway (1)**		

The following table reports the ten most cited articles of the literature review and the corresponding number of citations. Six out of the ten most cited articles study IEQ factors (*e.g.*, temperature, air quality, lightening) and their impact on women. As expected, most cited articles are from high-ranking journals and seven of them are published at the beginning of the time span of this work (2012 and 2013).

Table B: Ten most cited articles and number of citations as to April 2021

Authors	Title	Year	Source title	Cited by
Frontczak et al.	Quantitative relationships between occupant satisfaction and satisfaction aspects of indoor environmental quality and building design	2012	Indoor Air	265
Karjalainen	Thermal comfort and gender: A literature review	2012	Indoor Air	205
Kim et al.	Gender differences in office occupant perception of indoor environmental quality (IEQ)	2013	Building and Environment	125
Tyler and Cohen	Spaces that matter: Gender performativity and organizational space	2010	Organization Studies	122
Choi et al.	Investigation on the impacts of different genders and ages on satisfaction with thermal environments in office buildings	2010	Building and Environment	77
Schiavon and Altomonte	Influence of factors unrelated to environmental quality on occupant satisfaction in LEED and non-LEED certified buildings	2014	Building and Environment	72
Sakellaris et al.	Perceived indoor environment and occupants' comfort in European "Modern" office buildings: The OFFICAIR Study	2016	International Journal of Environmental Research and Public Health	70
De Been and Beijer	The influence of office type on satisfaction and perceived productivity support	2014	Journal of Facilities Management	64
Bodin Danielsson et al.	Office design's impact on sick leave rates	2013	Ergonomics	63
Banks and Milestone	Individualization, gender and cultural work	2011	Gender, Work and Organization	61

The next table shows the distribution of the articles in the different journals. Forty-six journals collect from 1 up to 8 articles each. As expected, given the interdisciplinary nature of the theme, these journals cover a wide range of disciplines, ranging from spatial matters (*e.g.*, *Building and Environment; Ergonomics; Facilities*) to business and organization studies (e.g., *Gender, Work and Organization; Business Horizons; Organization Studies*) to psychological and sociological studies (*e.g.*, *Social Indicators Research; Equality, Diversity and Inclusion: An International Journal; Human Relations*).

Table C: Number of articles per academic journal

Source title	Subject area (from Scimago Journal Rankin)	Category area (from Scimago Journal Ranking)	# of paper per journal	Percentage journal distribution (%)
Building and Environment	Engineering	Building and Construction	8	12%
Gender, Work and Organization	Social Sciences	Gender Studies	4	6%
Ergonomics	Social Sciences	Human Factors and Ergonomics	3	4%
Facilities	Engineering	Architecture	3	4%
International Journal of Environmental Research and Public Health	Environmental Science	Health, Toxicology and Mutagenesis Pollution	3	4%
Applied Ergonomics	Engineering	Engineering (miscellaneous)	2	3%
Indoor Air	Engineering	Building and Construction	2	3%
International Journal of Work Organisation and Emotion	Business, Management and Accounting	Organizational Behavior and Human Resource Management	2	3%
Journal of Corporate Real Estate	Business, Management and Accounting	Business, Management and Accounting (miscellaneous)	2	3%
Journal of Facilities Management	Business, Management and Accounting	Business and International Management	2	3%
Organization Studies	Business, Management and Accounting	Management of Technology and Innovation	2	3%
PLoS ONE	Multidisciplinary	Multidisciplinary	2	3%
Others			33	49%
TOTAL			**68**	

The following figure adds further evidence to the interdisciplinary nature of the theme by showing the subject areas to which the reviewed articles belong as retrieved from the Scimago Journal Ranking (SJR)[17].

[17] Accessible at: https://www.scimagojr.com

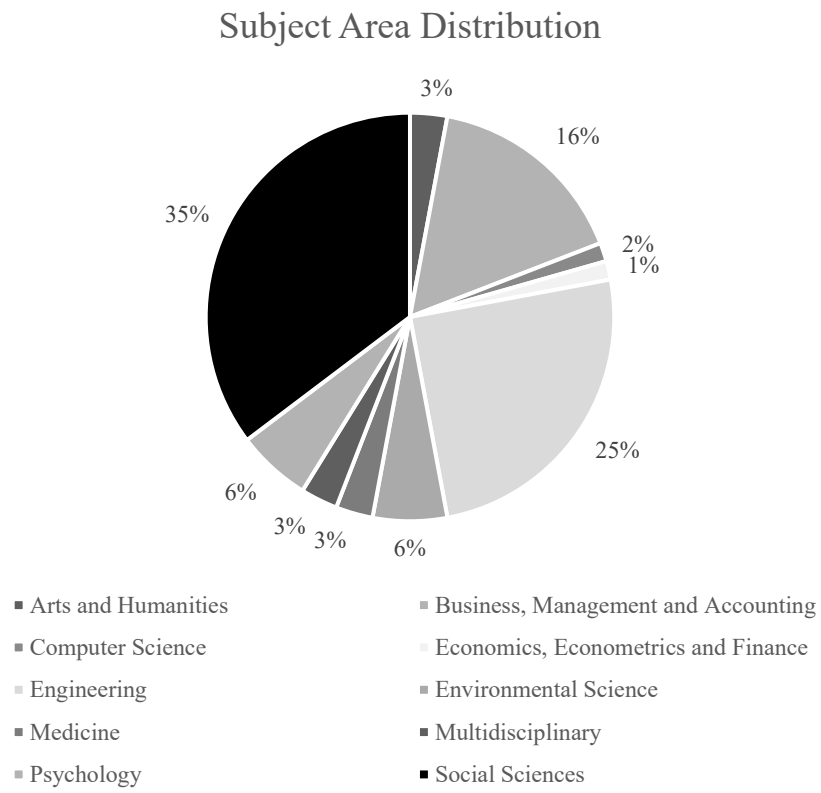

Figure B: Subject areas of reviewed articles

Finally, given the above mentioned interdisciplinarity, this paper checks how many studies involve authors with different disciplinary backgrounds. Authors' background is proxied by authors' department affiliations (as reported in the reviewed articles): 48 articles out of 68 are written by authors from the same departments. Seven articles are written by scholars from departments working on similar disciplines (*e.g.*, engineering and built environment, architecture, real estate); this SLR does not consider these articles as fully interdisciplinary. Instead, 13 articles – as shown in the following table - are overtly interdisciplinary; notably, six of these articles are published in journals addressing a miscellanea of subjects according to SJR.

Table D: Authors' background of the 14 interdisciplinary articles in the review.

Authors	Authors' background†	Title	Year	Journal	Journal Subject area (from SJR.)	Journal Category area (from SJR)
(A1) Burchell, (A2) Reuschke, (A3) Zhang	(A1) Sociology; (A2) Geography; (A3) Policy studies	Spatial and temporal segmenting of urban workplaces: The gendering of multi-locational working	2020	Urban Studies	Environmental Science	**Miscellaneous**
(A1) Candido, (A2) Marzban, (A3) Haddad, (A4) Mackey, (A5) Loder	(A1) Design; (A2-A3) Architecture; (A4) Health science; (A5) Design professional	Designing healthy workspaces: results from Australian certified open-plan offices	2020	Facilities	Engineering	Architecture
(A1) Danielsson, (A2) Bodin, (A3) Wulff, (A4) Theorell	(A1) Architecture; (A2) Statistics; (A3) Psychology; (A4) Medicine	The relation between office type and workplace conflict: A gender and noise perspective	2015	Journal of Environmental Psychology	Psychology	Applied Psychology Social Psychology
(A1) De Vos, (A2) Meijers, (A3) van Ham	(A1-A2) Architecture; (A3) Geography	Working from home and the willingness to accept a longer commute	2018	Annals of Regional Science	Social Science	**Miscellaneous**
(A1) Haynes, (A2) Suckley, (A3) Nunnington	(A1) Built environment; (A2) Business; (A3) Real estate	Workplace productivity and office type: An evaluation of office occupier differences based on age and gender	2017	Journal of Corporate Real Estate	Business, Management and Accounting	**Miscellaneous**
(A1) Munsch, (A2) Ridgeway (A3) Williams	(A1-A2) Social sciences; (A3) Law	Pluralistic Ignorance and the Flexibility Bias: Understanding and Mitigating Flextime and Flexplace Bias at Work	2014	Work and Occupations	Business, Management and Accounting	Organizational Behavior and Human Resource Management
(A1) Sakellaris, (A2) Saraga, (A3) Mandin, (A4) Roda, (A5) Fossati, (A6) de Kluizenaar, (A7) Carrer. (A8) Dimitroulopoulou, (A9) Mihucz, (A10) Szigeti. (A11) Hänninen, (A12) de Oliveira Fernandes, (A13) Bartzis, (A14) Bluyssen	(A1-A2-A8-A12-A13) Mechanical Engineering; (A3-A6-A9-A10) Environment; (A4-A14) Architecture; (A5- A7-A11) Health	Perceived indoor environment and occupants' comfort in European "Modern" office buildings: The OFFICAIR Study	2016	International Journal of Environmental Research and Public Health	Medicine	Public Health, Environmental and Occupational Health
(A1) Shepherd-Banigan, (A2) Bell. (A3) Basu, (A4) Booth-LaForce, (A5) Harris	(A1-A2-A3-A4-A5) Health science - Nursing and Pharmacy; (A3) Economics	Workplace Stress and Working from Home Influence Depressive Symptoms Among Employed Women with Young Children	2016	International Journal of Behavioural Medicine	Psychology	Applied Psychology
(A1) Stang Våland, (A2) Georg	(A1) Organization; (A2) Planning	Spacing identity: Unfolding social and spatial-material entanglements of identity performance	2018	Scandinavian Journal of Management	Business, Management and Accounting	Strategy and Management
(A1) Tremblay, (A2) Thomsin	(A1) Organization, (A2) Geography	Telework and mobile working: Analysis of its benefits and drawbacks	2012	International Journal of Work Innovation	Business, Management and Accounting	Management of Technology and Innovation OR Organizational Behavior and Human Resource Management
(A1) Wasserman, (A2) Frenkel	(A1) Organization and Management; (A2) Anthropology	Spatial Work in Between Glass Ceilings and Glass Walls: Gender-Class Intersectionality and Organizational Aesthetics	2015	Organization Studies	Business, Management and Accounting	Management of Technology and Innovation OR Organizational Behavior and Human Resource Management OR Strategy and Management
(A1) Weijs-Perrée, (A2) Appel-Meulenbroek, (A3) Arentze, (A4) Romme	(A1-A2-A3) Built Environment; (A4) Industrial design	The influence of personal- and business centre characteristics on knowledge sharing types in business centres	2019	Facilities	Engineering	Architecture
(A1) Yerkes, (A2) Andre, (A3) Besamusca, (A4) Kruyen, (A5) Remery, (A6) van der Zwan, (A7) Beckers, (A8) Geurts	(A1-A2-A3-A4-A5) Social science and Management; (A6) Labour studies; (A7-A8) Behavioural Science	'Intelligent' lockdown, intelligent effects? Results from a survey on gender (in)equality in paid work, the division of childcare and household work, and quality of life among parents in the Netherlands during the Covid-19 lockdown	2020	PLoS ONE	Multidisciplinary	**Miscellaneous**

† Authors' background is proxied by authors' department affiliations reported in the reviewed articles. Only articles whose authors work in clearly different university departments are considered interdisciplinary.

TABLE CAPTIONS

Table 1: Thematic framework.

Table 2: Overview of the theories adopted and/or mentioned in the reviewed papers.

Table 3: Recommendations for gender-inclusive workspace design.

FIGURE CAPTIONS

Figure 1: Flow diagram of the searched and included articles.