THE PSYCHOLOGICAL IMPACTS OF OFFICE TYPES: A SCOPING REVIEW

by

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Signed: Date: 21/11/2022

Abstract

The office is a significant environment for most ordinary individuals. With a substantial portion of their waking hours spent in these environments, the designs of these environments are a crucial consideration for the well-being of all persons. This scoping review is underpinned by the five-stage framework by Arksey and O'Malley (2005). The purpose of this review is to provide a comprehensive overview of relevant recent research regarding the psychological outcomes of differing office designs, specifically focussing on the closed layout, open-plan, and activity-based working offices. Only studies from 2016 onwards were included due to the comprehensive nature of a previous work by Kegel (2017) and is further discussed later.

Our findings indicate that research on the effects of the office layout continue to be mixed and contradictory. This review has found that the effects of the open-plan office continue to be a key focus of recent literature, and literature on the effects of the activity-based working office have continued to grow and are summarised. Briefly, recent literature on both these office designs have confirmed pre-2016 findings and general assumptions relating to key outcomes, such as noise, distractions, and privacy. But they have also highlighted findings that challenges these pre-conceived ideas. Lastly, new themes relating to the perceived fit of the office design and the specific application of designs to occupations are highlighted, along with noticeable gaps in the literature. This review highlights research gaps concerning cultural differences in the relationship between psychological outcomes and office designs, and the skewed proportion of sample local originating from western societies which points to a potential misrepresentation of the working force.

Introduction

The typical adult employed in a full-time job works 40 hours per week (Employment New Zealand, 2022), adding up to roughly 24% of the week or a third of their weekdays. This adds up to being a significant portion of time spent by individuals within an office or work environment. As the Ministry of Health NZ (2018) recommends 7-9 hours of sleep for an average working-class adult, most individuals may be spending between 47% to 53% of their waking hours in their workplaces. If average persons are spending 8 hours of their days within an office, then it is conceivable that these office environments are a significant factor for these individuals, who likely only spend more time in their own homes. If we consider the occupations held by these individuals as well, these full-time roles are likely an essential part of their lives and are crucial to ensuring one's survival and lifestyle; meaning that these jobs may not only be important to one's sense of self but are likely also a significant stressor and concern for most persons. With the stressed importance of one's career to one's life, the environment in which one's career takes place is also of key importance to consider.

Psychological outcomes of the office workspaces, and their design layouts, have been of interest to social and environmental psychologists for over 40 years. These psychological outcomes affect both organisation and employee, and common research foci include items such as collaboration, communication, creativity, well-being, performance, and workplace or job satisfaction. Research on these outcomes has predominantly focussed on the effects of certain office designs, such as cell offices/closed office layouts, open-plan offices, and most recently, activity-based working office designs. The differences between these designs tend to be distinguished based on how enclosed or open a workspace is deemed. Cell offices (or closed-office layouts) are usually enclosed spaces occupied by an individual (Brennan et al., 2002). The spatial boundaries of these spaces are usually comprised by high removal partitions or permanent walls. Open-plan offices, on the other hand, tend to describe offices with open layouts with or without fixed inner walls or cubicles dividing the office space (Seddigh et al., 2014). Activity-based working offices are defined as flexible, non-territorial workplaces, commonly involving open-plan layouts (Wohlers & Hertel, 2016), but includes work zones or breakout rooms. These can be utilised depending on what conditions are required for the task at hand (Inamizu & Makishima, 2019), such as quiet zones (no noise) or meeting zones (for collaborative work). Activity-based working offices often employ the concept of flexi-desking (van der Voordt, 2004), meaning that employees are not assigned specific stations (Rolfo et al., 2018), and instead pick an available desk to use. Thus, eliminating the use of private desks, seating, and offices in favour of communal floor sections (Parker, 2016).

Origins of the Open-Plan Office

Open-plan offices were first introduced in the 1960s by a German furniture manufacturer (Shafaghat et al., 2015). The emergence of the open-plan office aimed to provide a new concept to the

office layout scene. Early advocates for open-plan offices claimed that these innovative designs increased work communication and productiveness, enhances working conditions, and lower financial costs (Zalesny & Farace, 1987). This is generally accepted by most researchers, and modern open-plan offices are often assumed to facilitate communication and interactions between colleagues, and subsequently, promote collaboration, productivity, and workplace satisfaction (Brand & Smith, 2005). However, open-plan layouts are also generally acknowledged to be more disruptive due to increases in noise levels and a loss of perceived privacy (Kim & de Dear, 2013).

Shortly after its introduction, research literature on in the open-plan office design started to emerge around the late 1960s to early 1970s. One early study of note is Brookes and Kaplan (1972), who simply looked to assess the difference in attitudes of employees when moving from an open-plan office to an innovative (at the time) office concept called a 'landscape office'. The concept of landscape offices was an adaptation of the early open-plan offices and was of huge interest in the 1970s. Fundamentally, it aimed to structure the layout of the office based on the needs of the organisation and what they needed to accomplish. These offices were a precursor to the modern open-office designs and aimed to emphasis the interaction of people, such that the arrangement of workstations was based on the observed patterns of communication and worked to facilitate workflow (American Psychological Association [APA], 2015). These designs typically grouped supervisors with employees in the same area and aimed to group peers, who were required to regularly communicate, together in the same or adjacent spaces. Portable partitions and other movable items of furniture, usually plants or cabinets, were used to separate areas and divide them into a variety of different, yet easily accessible, workspaces. This was likely done to create a sense of spatial openness, through the removal of set, permanent walls acting as spatial boundaries. These offices did not tend to hold rigid layout patterns but rather simply flowed and was flexible to the needs of the organisation and the employees working within. However, although these designs were well-thought and held with positive regard, the revolution eventually ended, perhaps because landscape office came with significant financial commitment. Eventually, trends started to move towards less financial demanding options - those who required less thought into the layout design and were "copy-pasted" for convenience. Although landscape designs are still utilised in the modern era, traditional cell offices or open-plan office designs began to dominate offices around the world from the 1980s onwards, and research on workspaces and office design began to focus solely on the effects of traditional cell office or open-plan office designs that were of higher significance.

Background on Activity-Based Working Offices

Initial articles highlighting activity-based working offices emerged around the start of the 2000s, such as Brunnberg (2000) and Vos and van der Voordt (2001), who referred to activity-based working offices as innovative, full of high expectations, and as "tomorrow's office". In the 1980s, the

foundation of the activity-based working office was set through an office concept acknowledged as a "CoCon-office" (COmmunication and CONcentration; Worthington, 1997, as cited in Appel-Meulenbroek, 2011). These offices simply allowed for people to use different forms of office settings for different activities. Later in the 1990s, two distinct conditions brought about the emergence of the activity-based working design that we see today (Appel-Meulenbroek, 2011). Firstly, low occupancy rate of these initial CoCon-offices brought about the sharing of office workplace amongst various companies, setting up the concept of hot-desking and the removal of private seating/office allocations. Companies sharing the space would simply occupy the offices or sections of the office at different times in a cohabitation manner. Secondly, and perhaps the most significant factor, the introduction of mobile technologies made working locations flexible and no longer fixed at a desk setup. With the modern advancement of technology, as well, the feasibility of activity-based working has since grown, as employees, situated within a modern activity-based working office, need only be equipped with flexible, mobile data and communications technology; allowing them to work in any location, wirelessly or on a network (Parker, 2016). As communication is imperative to all companies, the consistent availability to connect with peers and supervisors has been the driving force for the recent shift of offices to activity-based working offices; this and the reduction of accommodation costs afforded by the activity-based working design (Appel-Meulenbroek, 2011). These costs are simply defined as the cost to accommodate employees at the office by providing the equipment required to work (Pole & Mackay, 2009). While traditional open-plan and closed layout offices require a personalised desk setup for each individual, activity-based working offices are able to limit these setups by simply providing an electronic device capable of facilitating office communication without the furniture or dedicated office space. However, activity-based working does require employees to adopt a flexible working style, requiring them to be able to appropriately identify the required conditions for their task and shift to the required zone. This shift in work habits may cause unfamiliarity which could result in difficulties with workplace satisfaction and, subsequently, work performance. Overall, Parkin et al. (2011) concluded that work areas consisting of open and half-open spaces (activity-based working designs) were the most desirable, compared to other office designs, regarding levels of employee satisfaction, collaboration, and privacy. This, combined with the lower financial and space requirement, could help explain the emergence of activity-based working as the preferred choice for many modern offices today.

Key Outcomes Related to Office Spaces

Recently, a literature review was done by Kegel (2017) with the purpose of providing a thorough evaluation of the academic literature regarding the effects of the physical office environment on organisations and their employees. Encompassing 107 articles, this study specifically focussed on the relationships between the workspace and psychological outcomes, rather than the differing effects of specific office designs. However, Kegel's (2017) review does highlight significant relationships

which are important, and crucial, to acknowledge and comprises of several limitations that can be addressed. Kegel (2017) highlighted key relationships between the workplace design and creativity, communication and collaboration, employee performance and productivity, employee satisfaction, employee well-being. However, hidden within sub-topics of Kegel's (2017) review were underlying themes that were either not specifically highlighted or omitted entirely.

Noise

The importance of noise levels in the office space can be seen to have a significant effect on various psychological outcomes. Jahncke et al. (2011) noted that high noise levels within open-plan offices had negative impacts on employees' motivation (uninterest) and memory. The mechanisms behind these effects on memory and motivation were not noted by Jahncke et al. (2011). But with regard to memory, Hongisto (2005) suggested that it was the speech intelligibility of the background noise (clarity of speech) rather than the noise in general that influenced cognitive performance; that higher speech intelligibility correlated with lower cognitive performances. Feasibly, the noise levels that Jahncke et al.'s (2011) employees experienced could have contained highly intelligible speech that distracted their focus away from the memorisation task at hand. Referring to motivation, the mechanism is unclear, but perhaps the inability to focus in the presence of high noise levels lead them to give up on the task at hand due to feelings of hopelessness or apathy. High noise levels also had a positive correlation on individual's fatigue, with employees finding that they were more tired in high noise environments compared to low noise environments. Kegel (2017) also highlighted the findings by Kim and de Dear (2011), who found that noise levels, when above employees expectations, correlated with a decrease in workplace satisfaction. Smith-Jackson and Klein (2006) also noted the effects of irrelevant speech, and its presence (volume and duration), can lead to decreases in employees' performance and increases in perceived stress and fatigue. Noise levels were also noted to have a significant negative impact on productivity (Hameed & Amjad, 2009). Of all environmental factors, noise was recognised to be the most influential (Mak & Lui, 2011). One correlation not mentioned by Kegel (2017) was of the positive impact of high noise levels on workplace conflict. However, this relationship was investigated by Danielsson et al. (2015), who did find a positive correlation between noise levels and workplace conflicts. Although moderate levels of workplace conflict can be seen as healthy and helpful to enact change within the workplace, unsolved conflicts can be detrimental for all parties within the work environment (Danielsson et al., 2015). Thus, it is plausible that while open offices may be fostering communication and collaboration, it may also inadvertently be creating more workplace conflicts that may be harmful to workplace relationships and team cohesion.

Privacy

Privacy is also another underlying theme in Kegel's (2017) work. Privacy is defined as an individual's desired level of social interaction (APA, 2015), and can be understood as the process of information control, the regulation of interactions with others, and the freedom from control by others (Laurance et al., 2013). It is highlighted that traditional closed office designs were more desirable for those wanting privacy (De Been & Beijer, 2013) due to the presence of spatial boundaries and the separation of workspaces by walls or significant partitions, resulting in the reduced levels of communication and distractions between colleagues. Open-plan offices, on the other hand, were noted to correlate with less perceived privacy, due to the decrease in spatial and audio boundaries.

Privacy also has a negative relationship with emotional exhaustion (Laurence et al., 2013), one of the three dimensions of burnout syndrome (Rotenstein et al., 2018); the other two being depersonalisation (increases in mental distance from one's job/feelings of negativism or cynicism related to one's job; Alsalhe et al., 2021) and reduced personal achievement (reduced feelings of professional efficacy; World Health Organisation, 2019). Emotional exhaustion refers to feelings of energy depletion or exhaustion (Alsalhe et al., 2021), manifesting through symptoms such as physical fatigue and feelings of being psychologically and emotionally "drained" (Maslach & Jackson, 1981). This relationship can be drawn from the *conservation of resources theory* by Hobfall (1989), which states that the lack of adequate resources to meet work demands are likely to cause a strain on an individual's emotional resources, and subsequently, lead to a higher felt emotional exhaustion. The experience of a lack of privacy may see the individuals feel a lack of adequate resources to complete their task, resulting in undesired reactions. Laurence et al. (2013) also noted that perhaps the lack of privacy enhances the pressure on individuals to divide their attentional span between work projects and managing the distraction, leading to the increase in risk of meeting the criteria for emotional exhaustion.

Privacy was noted to have a strong influence on productivity (Maalevald et al., 2009) and workplace satisfaction (Parkin et al., 2011), likely due to the reduction of distractions and potential background stressors (i.e., noise in the form of intelligible speech or irrelevant noise). However, the direction of the influence is dependent on the requirements of the task at hand and the individual's needs. If a particular profession required more collaboration and communication, then the privacy correlated with closed office layouts may be perceived as a hindrance and therefore resulting in a decrease in workplace satisfaction and productivity.

Gender Differences

Despite the importance of Kegel's (2017) literature, it seems to have largely omitted the theme of gender differences. Although this was mentioned once, when Kegel (2017) referenced Hameed and Amjad's (2009) findings, other articles exploring the roles of gender on these interactions, such as Danielsson and Bodin (2010) and Danielsson et al. (2015), have been omitted.

Hameed and Amjad (2009) found that the effects of noise levels on work productivity seemed to significantly impact males more than females. Additionally, their findings also concluded that temperature differences in the office, alternatively, impacted female productivity more than male productivity. Moreover, Danielsson and Bodin (2010) found that females were more susceptible to workplace stress than males across a range of different office types. Lastly, Danielsson et al. (2015) found the possibility that certain features of different office types may explain noted differences in the prevalence of workplace conflict between males and females. The study found that females reported more conflicts in activity-based working offices compared to men, while finding no significant differences in other office design types. This suggests that there may be an aspect of the activity-based working office that may be a cause of conflict for female employees.

Nevertheless, our current research's extensive background review has only been able to identify articles, focussing on gender differences, originating from the 2000s; likely something Kegel (2017) also struggled with which may explain their omission. Thus, this area of research can be seen to be severely lacking and an obvious gap in the literature; and an aspect of the current study will be to address this gap.

Research Aims

Arksey and O'Malley's (2005) methodology for scoping reviews proposed four potential reasons on why researchers may adopt such a review: (1) to examine the extent and nature of research activity; (2) to identify whether a systematic review is necessary; (3) to summarise and disseminate research findings; or (4) to identify potential research gaps within the existing literature. The approach of this article's scoping review will be to consider key research findings, identify potential research gaps within the existing literature, and to summarise and disseminate research findings.

In the last few years, offices have been operating very differently. With the constant advancement in technology and the changes in societal expectations and norms, the office work environment is very different from those seen in the early to late 2000s. Modern organisation have also elected to move away from closed office layouts in preference for open-plan designs (i.e., Bernstein & Turban, 2018; Smollen & Morrison, 2020) and activity-based working layouts (i.e., Haapakangas et al., 2019; Rolfo et al., 2018). One important consideration that will not be highlighted by this current review is the effects of the Coronavirus (Covid-19) pandemic. Although this pandemic has significantly altered peoples work and office habits, the effects of Covid-19 will not be considered in our research aims due to the fact that research on the effects of Covid-19 on office types are still very new and limited at the moment of data collection. Additionally, accounting for the pandemic would have been a significant factor that would have likely contrasted the findings of these already mixed results. Thus, the decision was taken to not focus on the pandemic. This will be further deliberated later in the discussion section.

A brief overview of recent literature will also highlight a new area of recent literature regarding office designs: the explicit application of an office type to a specific occupation (e.g., Braat-Eggen et al., 2017; Weziak-Bialowolska et al.,2018). This is an interesting theme of recent literature and is obvious as to why this as emerged as an area of interest. These specific applications studies can have large social significance and enable industries to capitalise on and fully utilise their potential through the maximisation of their employees aided by the environment around them.

Taking into account the literature reviewed above, this current study will have several key research aims. In addition to the already mentioned aim to summarise key research on gender difference, this study will also aim to highlight specifically highlight recent literature. As Kegel (2017) was reasonably comprehensive, it may be redundant to reconsider past literature that had already been discussed by their review. Hence, this study will only include recent articles from 2016 onwards; Kegel's (2017) study only included literature until 2015.

This will include specifically considering key research findings on any recent articles highlighting the open-plan office. Additionally, as the activity-based working layout is a product of recent technological advancements in the modern world, literature on activity-based working offices is still relatively small, regarding the amount, and young, with only 20 years of research. With this notion, another aim of this article would be to highlight key research findings on the activity-based working design and provide a thorough summary of recent results. Lastly, as it has been highlighted that the nature of the working environment is constantly changing, a final aim of this research will be to highlight the new and emerging themes of recent literature and identify any apparent gaps yet to be explored.

Method

The method for this scoping review will be outlined by Arksey and O'Malley's (2005) five-stage framework. This is due to the reliability of the framework through its rigorous process of transparency which also allows for future replication. Additionally, this framework was chosen due to the clear and coherent structure it presents. The structure of this current study's methods will closely follow those adopted by O'Flaherty and Phillips' (2015) scoping review. The five stages of Arksey and O'Malley's framework are: (1) identifying the initial research questions, (2) identifying relevant studies, (3) study selection, (4) charting the data, and (5) collating, summarising, and reporting the results.

Stage 1: Identifying the Initial Research Questions

The focus of this review is the identification of key features of the research between differing office designs/layouts, to identify potential research gaps, and to address concerns raised through this

current study's research aims. To guide our data collection, the following initial questions were proposed:

1. What themes have recent literature highlighted regarding the utilisation of open-plan offices and closed office layouts?

2. What has recent literature observed regarding the emergence of activity-based working offices?

3. What has recent literature found regarding gender differences in the effects of office designs?

4. What new themes have emerged since 2016?

Stage 2: Identifying Relevant Studies

Arksey and O'Malley (2005) noted that a wide range of key words for search terms should be adopted to glean a 'broad coverage' of available literature. Keywords from articles which inspired this research, and others found through brief search, were highlighted before synonyms were drawn into a comprehensive list. From this list, search terms were then trialled to test for effectiveness before a list of final search term was eventually settled upon:

"Cell Office", "Traditional Office", 'Closed Office", 'Open-Plan Office", "Open Office", "Flex Office", "Closed Office Layout", "Office Types", and "Activity Based Working"

Next, inclusion and exclusion criteria were developed and set. A full list of inclusion and exclusion criteria is outlined in Table 1.

Table 1.

Inclusion and Exclusion Criteria.

Criterion	Inclusion	Exclusion
Time Period	2016 - 2022	Studies outside these dates
Language	English	Non-English studies
Type of Article	Original research, published in a peer review journal	Articles that were not peer reviewed or original research
Study Focus	Noted differences in areas of interest relating to the differences in office type/design	Articles that focussed on other common aspects of the office

Literature Focus	Articles where the overwhelming theme relates to the differing effects of office designs	Articles that made a passing or token reference to office designs, but focussed on other aspects not specifically relating to the office type i.e., Lighting

The following four electronic databases were searched: PsycINFO, Taylor & Francis Online, SocINDEX, Science Direct. These databases were chosen due to their comprehensiveness, noted centrality within the discipline of psychology, and due to their available access through university resources. Each database search utilised the mentioned search term and was filtered for relevance where appropriate. PsycINFO's database simply required a keyword search with our search terms, whereas Taylor & Francis Online required us to filter by 'Subject' (Psychological Sciences). Science Direct required us to filter by 'Source Type' (Review & Research Articles) and 'Publication Title' (Journal of Environmental Psychology). Lastly, SocINDEX required us to filter by 'Source Type' (Academic Journals), 'Language' (English), and by 'Subject', which was extensive:

"Offices, Office Layout, Open Plan (Building), Work Environment, Design, Office Design & Construction, Architectural Design, Environmental Research, Office Building - Design & Construction, Open Plan Offices, Open Spaces, Organisational Structure, Quality of Work Life, Shared Workspaces, Space (Architecture), Task Analysis"

Two other search techniques were also utilised in our data collection methodology: Backward & Forward searching. For backward searching, this required utilising initial articles which influenced this study and screening through reference lists for relevant research which met our criteria. Forward searching required the identification of key, seminal articles which has influenced this field of study. From there, Google Scholar's and PsycINFO's forward search function, which found future citing articles, was utilised to create a list to be screened for relevance.

Stage 3: Study Selection

The process of article selection followed the Preferred Reporting of Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement (Moher, Liberate, Tetzlaff, Altman, & The PRISMA Group, 2009). This was done in accordance with O'Flaherty and Phillips' (2015) study design. Figure 1. illustrates the process of article selection.

Figure 1

PRISMA flow diagram for article selection.
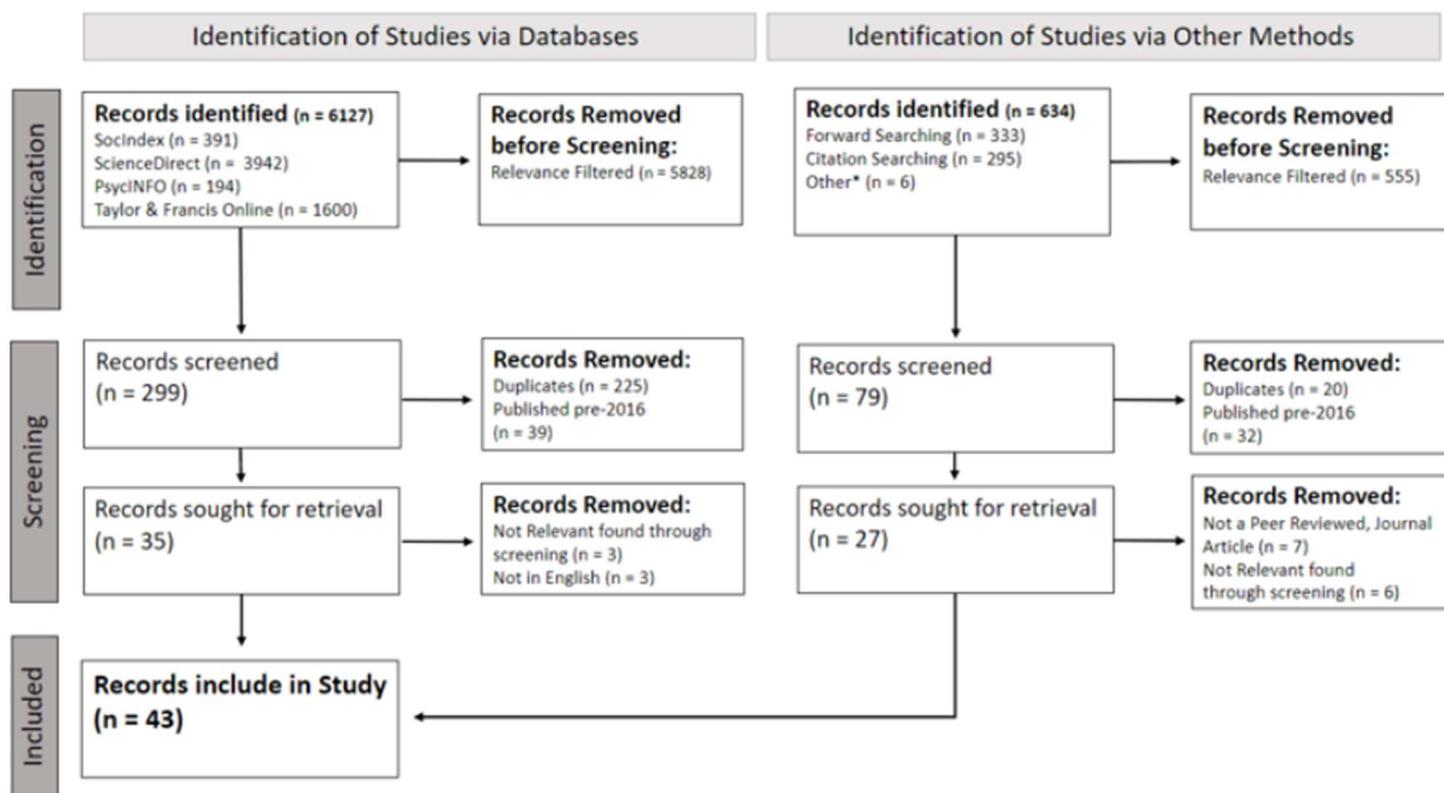
As seen on Figure 1, using the search term created and the forward and backward search method, 6,761 articles were initially identified. From there applying relevance filters to the e-database searches, as well as completing a basic relevance check to filter through forward and backward search lists, gave a list of 378 articles to begin screening through. Duplicates and the 'Time Period' criterion was then applied to exclude 316 articles to provide a final list of 62 articles which required detail screening before final inclusion. From this final list, 19 articles were removed due to a lack of access, the article not being in English, or they were found to not be peer, reviewed journal articles. Thus, guided by the inclusion and exclusion criteria, a final 43 articles were identified as being relevant to the research topic.

Stage 4: Data Charting and Collation

The fourth stage of Arksey and O'Malley's (2005) scoping review framework is the charting of selected articles. Summaries were developed of each article related to the author, year, location of study, study design, and a brief comment on the findings of each individual study (See Appendix A).

Stage 5: Summarising and Reporting Findings

The final stage of Arksey and O'Malley's (2005) scoping review framework summarises and reports findings.

Findings

This section presents articles which were the focus of our initial research questions. This includes discussions on notable psychological differences observed between office designs, observed gender differences seen in these effects, observed moderating effects of perceived fit and noted attempts of office designs to specific occupations.

This scoping review returned 43 articles from 17 countries. Of these, 9 studies were conducted in Sweden, six in the United States, five in the Netherlands, three in Finland, three in Germany, two in Australia, two in the United Kingdom, and one each from Iceland, Austria, New Zealand, Spain, Japan, Turkey, France and Brazil. Another specific study was conducted within China and Korea. Potential trends in the origins of recent studies were examined and some interesting points of considerations emerged which will be addressed later by this current review.

Question 1: What themes have recent literature highlighted regarding the utilisation of open-plan offices and closed office layouts?

Several articles focussed on the effects of noise, privacy, and distractions within open-plan offices. Interestingly, recent articles have chosen not to highlight themes of a closed office layout, but rather noting the transitions of organisations away from them towards open-plan offices or activity-based working offices (i.e., Bernstein & Turban, 2018; Rolfo et al., 2018; Seddigh et al., 2016). Węziak-Białowolska et al. (2018) found that open-plan offices had a tendency to limit feelings of privacy and increased perceptions of intrusion amongst employees working together, both of which negatively correlated with job satisfaction and work engagement. However, it should also be noted that Inamizu and Makishima (2019) found that open-plan offices did not actually have a significant effect on privacy, in that they neither improved nor worsened privacy when shifting from closed office layouts to open-plan offices; but their findings were not so much saying that open offices did not influence privacy but rather highlighting that the presence of specialised work zones (characteristics of activity-based working) mitigated this effect. Distractions were well noted by Haapakangas et al. (2018) to be the central source of employee's environmental stress within open-plan offices, but Smith-Jackson et al. (2016) suggested that distractions and noise within open-plan offices did not impact performance or mental workload in their distraction study. However, this is contradicted by Hoendervanger et al. (2019), who found high-complexity tasks to not fit well with open-plan office designs, due to the associated noise and distractions. Rather, high-complexity tasks seemed to fit closed office layouts better due to the afforded privacy and lack of distractions. Additionally, it could be seen that Smith-Jackson et al.'s (2016) study design may simply not be generalisable as their design comprised participants in a lab setting, rather than direct observations of employee within a work environment. Leder et al. (2016) noted workstation size significantly reduced the impact of noise and the perceived lack of privacy in open-plan offices, and that larger assigned workstation were associated with greater workplace satisfaction. This was likely due to the increase in

perceived personal space. Moreover, the increase in distance between individuals, owing to the increase desk size, may also have contributed to a felt increase in privacy. Finally, Van Marrewijk and Van den Ende (2018) found that shifting to an open-plan layout from a closed layout can see an increase in creativity and collaboration, due to the removal of barriers between individuals, although they too did note an increase in noise and a decrease in privacy. Compared to activity-based working, cell offices, and any other office designs, open-plan offices were rated to be the worst in rated levels of noise by employees (Pitchfork et al., 2020)

Bernstein and Turban's (2018) study is one of interest to consider specifically. Following two Fortune 500 companies shifting from traditional cell offices to an open-plan office setting, the study utilised digital data from advanced wearable devices attached to the chest of consenting participants and monitored the activity of individuals on electronic communication servers (emails and instant messaging). The study hypothesised seeing an increase in face-to-face communication and, subsequently, an increase in collaboration and creativity. Additionally, Bernstein and Turban (2018) also hypothesised seeing a decrease in electronic interactions between co-workers. However, the outcome was the opposite and the volume of face-to-face interactions decreased significantly after the shift to the open-plan office, while electronic communication increased. Interestingly, this trend was also observed between employees working in close proximity to each other. The open design, with little to no spatial boundaries, seemed to trigger a natural human response to socially withdraw from officemates and interactions increased instead over email and instant messaging platforms. This social withdrawal resulted from the lack of spatial boundaries, which had employees feeling observed, especially by management, in turn causing them to feel uncomfortable with their environments and with approaching their colleagues in person. This means that the effect of this move to the open office design resulted in an unwanted and negative outcome for these companies and their employees.

Question 2: What has recent literature observed regarding the emergence of Activity-Based Working Offices?

A significant number of studies observed negative effects when moving into activity-based working office layouts. To start, activity-based working offices seem to be highly associated with an increase in noise, distraction, and loss of privacy (Haapakangas et al., 2018; Halldorsson et al., 2021, Hodzic et al., 2021; Öhrn et al., 2021; Rolfo et al., 2018), therefore reducing concentration (Eismann et al., 2022; Engelen et al., 2019); relating back to the conservation of resources theory (Hobfall, 1989) and the idea that an employee may not hold adequate cognitive resources to concentrate while under duress from negative workplace stimuli. Moreover, the observed negative reactions to activity-based working offices were more common when moving there from private rooms, common in cell offices (Haapakangas et al., 2019); perhaps due to a larger felt change in work requirements owing to the drastic change in work environment. Hodzic et al. (2021) also found that moving to an activity-

based working office was also significantly associated with negative effects on work engagement, job satisfaction, and fatigue. These findings do seem to relate back to Laurence et al.'s (2013) findings relating to privacy; a suggestion that perhaps the associated loss of privacy is the underlying cause of feelings of fatigue, and subsequently, emotional exhaustion. Overall, these relationships, and distraction, were negatively moderated by an increase in time pressure and unpredictability in the workplace (Hodzic et al., 2021). In other words, the lack of privacy and increases in noise and distractions, that came with the activity-based working layout, created feelings of low work satisfaction and engagement, accompanied by increased feelings of fatigue. But these feelings were made worse by any increases in time pressure to get tasks complete, and more so by the unpredictability cause by the moving and lack of daily structure that accompanies an activity-based working office.

The increased distractions, associated with activity-based working offices, were seen to moderate the effects negatively on collaboration and positively on stress (Haapakangas et al., 2018). Öhrn et al. (2021) additionally noted that employees in activity-based working offices experienced decreases in productivity and work environment satisfaction. They found that employees with high concentration work tasks experienced lower productivity, while those with a high proportion of teamwork-required tasks rated productivity to be continually high. Lastly, it was found that activity-based working office settings created an issue with peers not being able to find each other, which impaired communication and a sense of community (Haapakangas et al, 2019). According to Rolfo et al. (2018), a decrease in workplace satisfaction was also experienced through the loss of personal storage space. This can be combined with Halldorsson et al.'s (2021) finding that a loss of personally assigned/owned space contributed to a decrease in psychological ownership and environment satisfaction.

Despite all the highlighted negative impacts of activity-based working offices, studies have also found that activity-based working has positive merits in terms of interaction, communication, control of time and space, and contrast to Hodzic et al. (2021), workspace satisfaction (Engelen et al., 2019). Compared to open-plan offices, an activity-based working office has been found to improve visual privacy (Inamizu & Makishima, 2019), auditory privacy, and background noise satisfaction (Rolfo et al., 2018). Overall satisfaction with the physical work environment increased in activity-based working offices, compared to an open-plan design, and perceived performance did not change significantly (Rolfo et al., 2018). Theoretically, this indicates no differences in productivity between the two office designs. When mediated by appropriate support from management and proper organisation, activity-based working also showed small, but significant, positive changes to job performance and employees' perceptions of the work environment (Engelen et al., 2019). Engelen et al. (2016) also found that activity-based working offices supported employees' work health behaviours by finding that individuals showed less time sitting, and more time standing, at work.

Employees in Engelen et al.'s (2016) study also noted that they found their new activity-based working environment to be more stimulating, compared to open-plan offices. However, this increase in health behaviours can be perceived as strenuous by some individuals and may be contributing to Hodzic et al.'s (2021) findings of increases in fatigue. Moreover, Öhrn et al. (2021) also noted that despite these positive work behaviours, no significant difference was actually observed on employees' general health, compared to those in cell offices. Activity-based working offices have been noted to create an increase in social interactions, which in turn led to wider collaboration and personal networking leading to a boost in productivity (Eismann et al, 2022). This increased exposure to available information and interactions, in turn, increased employee's creativity due to the increase likelihood of forming new ideas and solutions.

A key feature of activity-based working design, which has been frequently highlighted, is the presence of quiet and active workspaces available for use by office workers. According to Inamizu and Makishima (2019), it was the various working zones within activity-based working offices, which are not present open-plan designs, which improved perceptions of privacy amongst employees. Activity-based working designs that supported undisturbed working, through quiet work zones, were positively associated with increases in vitality (defined as physical or mental energy or vigour; APA, 2015) and positive job attitudes (Wohlers et al., 2019). Davis et al. (2020) also found that breakout areas or active collaboration rooms in activity-based working designs strongly correlated with ease of communication, higher job satisfaction, and an increase in well-being. This was moderated by an individual's level of autonomy, with an increase resulting in a better ability to better manage their task requirements and adapt to challenges. Performance in high cognition tasks were also seen to be positively affected by quiet work zones, with performance increasing in these rooms compared to active zones, due to the drop in perceived distractions (Jancke & Hall, 2020).

Question 3: What has recent literature found regarding gender differences in the effects of office designs?

The process of this current study identified three articles examining the effects of gender differences. These articles observed effects of different office types on productivity, privacy, and sensitivity to distractions. Firstly, Danielsson (2016) observed a gender difference in sensitivity to external stimuli, in that women were found to have a greater sensitivity to environmental stimuli, such as office noise and distractions, compared to men, in all office types except activity-based working offices. In activity-based working offices, men were significantly more sensitive. This may be due to the lack of perceived status relating to the lack of a personal workstation. As there are greater exposures to environmental stressors as well in open-plan offices, findings also established that women had increased risks for sickness absence. Consequently, further findings from Danielsson (2016) show correlating gender differences in job satisfaction. That is, women reported lower job

satisfactions in offices with greater environmental stimuli (open-plan offices), while men reported comparatively lower job satisfactions in activity-based working offices, where they find less sense of status due to the lack of personal workstations; something which will be expanded upon later in the discussions. Danielsson (2016) also found gender differences in perceived quality of leadership in different office types. In closed office layouts, women rated leadership as worse, compared to their male counterparts. A hypothesis for this, suggested by Danielsson (2016), could be that closed office layouts prevent the development of a close relationship between manager and employees as the manager is not physically and/or visually present for the employees for the most part. However, the reasons for why females may be more influenced by this hypothesis, compared to males, are not made clear. Perhaps a closer relationship with managers is more sought after by women employees, but the gender of the manager may possibly also have an effect on this potential relationship.

        The next article identified was by Danielsson and Theorell (2019). Findings from this article firstly highlighted that women were significantly less satisfied with open-plan offices that utilised hot-desking (no assigned desk among employees), compared to men. Although, men were not satisfied either. This can be seen as a contrast to Danielsson's (2016) suggestion that only men found less satisfaction with offices with no personal workstations, as Danielsson and Theorell (2019) has found that women, as well, are affected by hot-desking open-plan offices. Perhaps, the dissatisfaction seen in male workers is due to a higher perceived assertiveness, generally possessed by men (Costa et al., 2001), but this does not explain why women were observed to be dissatisfied with hot-desking. One possible reason for this observation may be that men are displaying dominant habits in these open-plan offices where they are occupying all available workstations or perhaps consistently apprehending stations seen as more desirable; leaving the female employees to feel marginalised and undervalued. Danielsson and Theorell (2019) also noted that women in activity-based working offices also reported higher job satisfaction due to the access to specific zones, compared to men. This could be explained by a possible notion that women benefit more from the availability of breakout rooms. More likely, however, is that this finding is simply supporting Danielsson's (2016) suggestion of a low sense of status in activity-based working offices.

        Lastly, a longitudinal study by Morrison and Smollan (2020) employed a mixed methods research approach and recorded the move of a law firm to an open-plan layout but aimed to appropriately fit the design layout according to the needs of the employees. The study observed that some female employees working within an open-plan office reported feeling observed while in the workplace, but their male co-workers did not. Specifically, interviewed female employees described feeling "more accountable" and "exposed", which lead to them modifying their work behaviour and their workplace attire. Whether female employees were really being observed more than males was unknown, but what is known is that they perceived to be. Yet, past literature examining the "male gaze", and finding it to be a real experience for women (Gervais et al., 2013), would suggest that

perhaps some element of observation is occurring. This potential occurrence of the male gaze would suggest that there is an element of observation that is difficult to address but may need to be considered in future office designs to ensure women are able to feel safe at work. However, the practicability for office designs to account for this interaction may not be achievable outside of simply employing a cell/closed office layout.

Question 4: What new themes have emerged since 2016?

The Applications of Office Types into Specific Occupations

Our findings also noted four case study articles which attempted to record and highlight the specific applications of open-plan office designs into certain occupations: academic staff, students, social workers, and an architectural firm. These studies concentrated on looking at the psychological outcomes of the office design in use on these job types and assessed the results.

In Van Marrewijk and Van den Ende's (2018) application of an open-plan design to university staff, their findings revealed an emergence of new, and changes to old, work practices by the academic staff. For one, the study found that colleagues, who were now more visible to one another, experienced more spontaneous encounters and formed a stronger identification with the faculty, thus increasing collaboration which was a key target of the study. However, academic staff were also found to experience a loss of privacy, specifically from students. The new open-plan design had incorporated shared, mixed spaces, in which students and staff could interact. But the study quickly found that these areas quickly became dominated by students eager to utilise the new environment, which further contributed to a sense of lost territory and privacy by the staff. Upon the end of the study, Van Marrewijk and Van den Ende (2018) found that the academic staff would rather choose to have their previous, closed offices than their new open-plan workstations.

In Jeyasingham's (2016) open-plan office application to a social work organisation, a significant increase in autonomy and the ability to observe, learn, evaluate, and collaborate with nearby peers was seen as a positive outcome of the design. It is important to note that this open-plan office format had no assigned desking and instead just had available stations which social workers could just occupy on a day-to-day basis (hot-desking). A number of considerable concerns were noted by social workers in this work environment. Firstly, one participant noted a loss of felt togetherness, as the peer next to them was consistently changing. A lack of personal space and psychological ownership was also noted as a raised concern. Another noted observation was the key concern for the lack of confidentiality and privacy required in their profession. Jeyasingham (2016) brings to question the value of the positive outcomes over the well-documented concerns and subsequent decrease in workplace satisfaction of the social workers.

Weziak-Bialowolska et al. (2018) observed the application of an open-plan office to 20 architectural firms, comprising of 456 employees. The study noted the expected loss of privacy and decrease in job satisfaction. Interesting though are the observed high perceptions of intrusion amongst architects and designers and the perception of high office density (too many people, not enough room). The study found further evidence for irritability and perceptions of ill-fit (of the design to their work) to play mediating roles on the effects of social relationships as well; in that, privacy and intrusions were mediated by perceptions of irritability, and a lack of perceived fit, in their negative effects on social relationships. Essentially, the more employees found the office design to be unsuitable, and the more irritated they were, the more these feelings of intrusions and of no privacy would negatively impact their social relationships within the office. Weziak-Bialowolska et al. (2018) concluded by remarking that future office should take on activity-based working or combi- (mix of open-plan and cell office) office designs. A notion that is understandable based on his findings but may be premature, or inappropriate, as a general recommendation to all occupations.

Braat-Eggen et al. (2017) looked at the application of an open-planned layout study space for university students to utilise. The study found that 38% of surveyed students were disturbed by background noise in the open-plan study environment, and that students were mostly bothered by speech when performing complex, high cognition tasks, such as studying for an exam, reading, or writing. No potential positive observations on collaboration or creativity were noted by Braat-Eggen et al. (2017) as it was not the intention of the study.

Office Types and Perceived Fit

Recent literature has brought forth a new concept of perceived fit, which this current review understands to be the suitability of the office design to fit in with an individual's personal traits/needs. This is based on the *person-environment fit theory* (Edwards et al., 1998), which is defined as the match between an employee's characteristics, their work environment, and their tasks. Hence, it can be seen that that a perceived fit between work settings, activities, and an employee's personal needs may produce a positive outcome such as job/environment satisfaction and an increase in performance and productivity (Hoendervanger et al., 2019).

Of late, research has found perceived fit to be a significant moderator in the psychological effects of office designs. According to Soriano et al. (2020), perceived office fit is an important moderator in the relationship between well-being and performance. Additionally, perceived fit has been found to be positively correlated with task performance and work environment satisfaction (Hoendervanger et al., 2019). More emotionally stable participants also tend to report lower distraction, particularly those working in activity-based working offices (Seddigh et al., 2016). More on perceived fit's interaction with activity-based working offices, Wohlers et al. (2019) found that the perceived and appropriate fit of activity-based working offices by employees were positively

correlated with trust in management and negatively correlated with a need for routine seeking. As well, job attitudes and vitality were also explained by the relative fit to the task and perceived appropriate use of activity-based working offices. Soriano et al. (2021) also provides supporting evidence for the importance of perceived fit, by finding that workspaces that fit the work patterns of employees are more likely to encourage flow, and subsequently, benefit the organisation. Flow can be defined as a state of operating at full capacity arising from an intense connection with an activity that one may find enjoyable and/or when one's skills are fully utilised, yet equal, to the demands of the task (APA, 2015; Nakamura & Csikszentmihalyi, 2014). Thus, this suggests that an increase in perceived fit by employees may even result in increases in enjoyment of the work and provide employees with the environment and tools to cope with their work demands. Perhaps even reducing the risks of Burnout Syndrome onset, as the ability to meet the demands of the task may also moderate the relationship between emotional exhaustion and privacy, noted by Laurence et al. (2013).

Seddigh et al. (2016) and Linberg et al. (2016) also looked at the effects of certain Big-Five personality traits (Fiske, 1949): Agreeableness (a tendency to show high prosocial behaviours such as altruism, trust, and kindness), Openness (a tendency to be more adventurous, creative, and eager to learn), Extraversion (how outgoing and sociable one is), and Neuroticism (characterised by moodiness, sadness, and emotional instability). Agreeableness and openness were found to be significantly associated with higher reported levels of distraction among employees in open-plan offices (Seddigh et al., 2016). This was perhaps seen due to an increase in the sociability that comes from an increase in agreeableness and openness; in turn, likely contributing to a decrease in productivity levels. Additionally, neuroticism was seen to moderate the relationship between office design and perceived control (Linberg et al., 2016), whereby higher reported levels of neuroticism was associated with less control in open workspaces and lower perceived performance. This is understandable when considering that higher levels of neuroticism may see lower resilience to stress brought about by noise and distractions. Linberg et al. (2016) also explored the effects of extroversion and highlights a potential moderating role in the relationship between exposure and perceived performance, seeing that an increase in extroversion brings about an increase in perceived performance in exposed workspaces (open-plan offices), compared to enclosed spaces (cell offices); perhaps the increase in assertiveness and sociability reduces the negative effect of noise, distraction, and lack of privacy.

Referring back to Morrison and Smollan's (2020) article, the study found that the specific and thoughtful fit of an office design to the needs of the employees and the requirements of their tasks actually resulted in positive outcomes relating to environment satisfaction, workplace relationships, and communication. Their findings showed that participants overall rated their liking of the office highly, as well as their own personal workspaces. The thoughtful design of this open-plan office was also able to improve relationships of people working in proximity as well as through the interactions

gained in the shared spaces and recreational area (kitchen/café area). No significant differences were seen between the recorded productivity levels at the start of the study compared to the follow-up survey 14 months later, but scores were generally rated positively. Although some participants did note that privacy was an issue for them, there was no significant difference between satisfaction with privacy between the evaluations from the start and the end of the study, showing that there was no degenerating effect in the design. Mean privacy scores also rated above average, leaning more towards the satisfied end of the continuum. Lastly, communication was noted to be positive in participants' interviews; seeing that although there may be distractions, open communication was good to have. Thus, Morrison and Smollan (2020) show that a careful creation of an open-plan office that are "safe by design" (2020, pg. 9) can ameliorate many of the negative consequences associated with open-plan designs, compared to the use of financially inexpensive, standardised designs.

Discussion

This section aims to summarise the findings for each of our research questions and provide a holistic overview of what is currently known about the differing office designs and its key associations and relationships; drawing attention to areas where there are prominent gaps within the literature.

Question 1: What themes have recent literature highlighted regarding the utilisation of open-plan offices and closed office layouts?

This review noted a trend for recent literature to highlight the differences in psychological outcomes when specifically shifting from a closed office layout to an open-plan office. Additionally, literature seems to have not focussed on the effects of closed office layouts in general, perhaps dismissing this topic as traditional research or holding the belief that no new insights could possibly be drawn regarding the cell/closed office design. Rather, literature has simply used closed office layouts as a comparison point for open-plan (and activity-based working) designs. However, as new themes and gaps in the literature appear, common sense would dictate that these themes will need to be assess against the closed office layout. As cell offices are still utilised in some modern office, this would still represent a topic of social significance.

As noted by Bernstein and Turban (2018), many modern corporations and organisations, especially those of high stature (e.g., Fortune 500 Companies), are making changes to open-plan offices. However, these moves seem to be done either to follow modern trends and/or to economically utilise the available space more effectively. Our findings have noted both desired positive (increase in creativity, communication, and collaboration) and undesired negative (increases in noise and distraction/decreases in privacy) psychological outcomes for employees working in an open-plan office, compared to a cell office. While this study does not aim to provide an opinion on whether these moves are encouraged or ill-advised, one consequence of this summary finding can be to

provide the necessary information to help create well-informed decisions by corporations looking to follow the change into an open office layout.

To summarise the findings of recent research, firstly, our review indicated a number of positive psychological outcomes of the open-plan office: namely, through increases in creativity and collaboration (Van Marrewijk & Van den Ende, 2018); confirming general assumptions stated by Brand and Smith (2005) and Zalesny and Farace (1987). However, recent literature has also highlighted negative correlations with outcomes, such as increases in distraction, noise level, and intrusions from co-workers, as well as decreases in privacy. High-complexity tasks were also seen to be ill-fitted with open-plan office designs, suited more so with closed office layouts. What can be seen is that our review seems to have highlighted significantly more negative correlations with psychological outcomes, than positive. This may indicate that there are more drawbacks associated with open plan designs than positive aspects.

Recent literature has also found evidence that disagrees with the noted preconceived assumptions. Bernstein and Turban (2018) found evidence that contradicts these assumptions by finding that their observed move to the open office design resulted in lower levels of face-to-face communication and less collaborative efforts. Additionally, Bernstein and Turban (2018) also noted that the "un-comfortability" formed by perceived feelings of observation within the open office were the reasons for their employees socially withdrawing from face-to-face communication and collaborations. Smith-Jackson et al. (2016) also found evidence against the assumptions which suggested that noise and distractions, commonly associated with open offices did not impact the performance or mental workload of participants in their study. However, their study's potential limitations have been noted.

This review has highlighted many different studies which both support and contrast each other to a varying degree. However, one possible explanation behind this pattern, or lack of, could be due to the varying context and backgrounds of the studies' research environment, participants, and researchers themselves. Overall, our current review has aimed to provide an in-depth summary of all findings relevant to the open-plan office; and has confirmed Smith-Jackson et al.'s (2016) view about the complexities of studying open-plan offices (and office designs) and applying findings generally across multiple different contexts.

Question 2: What has recent literature observed regarding the emergence of activity-based working offices?

As stated earlier, research on activity-based working offices is still relatively new and, prior to 2016, severely lacking. However, recent literature has aimed to fill this gap. This is evident to our review, as 19 of our 43 included studies focus, or make reference, to activity-based working.

The negative effects of moving into an activity-based working office (as the trend) seems to be the main focus for majority of these studies. As seen with open-plan offices, the activity-based working seems to also correlate with increase in noise and distraction, and a decrease in privacy, job satisfaction, and concentration; suggesting that movement from open-plan offices to activity-based working may not have much benefit. Moreover, the activity-based working office was also significantly associated with negative effects on work engagement between colleagues and fatigue. Perhaps showing more adverse associations relating to the activity-based working office and suggesting that activity-based working may be worse than open-office working.

However, findings on activity-based working offices are also contradictory, like those on open-plan layouts. Several studies have also shown activity-based working to be associated with increases in audio and visual privacy, work satisfaction, and noise satisfaction. One reason to explain this contrast could be that different aspects of the activity-based working environment or other contexts are causing these conflicts in outcomes of interest across studies. For example, the decrease in privacy for Halldorsen et al.'s (2021) employees were suggested to be due to the prior move from a closed/cell office layout. However, Inamizu and Makishima (2019) found participants who previously worked in an open-plan office, recorded activity-based working to improve privacy. Thus, our current review continues to highlight the importance to consider for the context in which these studies are conducted. This consideration, as noted with open-plan literature, seems to play a significant role to complicate this research field of interest.

These findings by Inamizu and Makishima (2019) also suggested that the specific presence of work zones (quiet and collaborative) actually make activity-based working ideal to open offices as they are able to improve upon perceived noise and distraction levels when one is in a quiet work zone, subsequently improving perceptions of privacy in the workplace as a whole. The findings of Davis et al. (2020) also confirm the notion that activity-based working is better by highlighting that the active collaboration zones also correlate with increases in communication, job satisfaction, and well-being. Together, this suggests that the work zones/breakout rooms of activity-based working offices may be the key to creating a highly rated office layout. However, this is moderated by the individual's sense of autonomy to dictate their own actions and where they can work. With that, one notable gap in literature is the effects of self-leadership on job satisfaction and productivity for those in activity-based working offices. In the same sense that autonomy positively mediates the relationship between activity-based working rooms and positive work and psychological outcomes, self-leadership should theoretically be a mediator in this relationship alongside autonomy.

One specific positive outcome associated with activity-based working is the suggested health benefits due to the positive work health behaviours the layout requires of their employees. Activity-based working understandably replaces prolonged sedentary sitting behaviour for more time being

active, moving from zone to zone. And common sense may conclude that this increase in healthy behaviours should result with more positive health. However, Öhrn et al. (2021) finds no significant support for this assumption, instead showing no significant effect on employees' general health. A possible explanation for this is that although activity-based working may demand that one adopts a more active work life, this does not necessarily mean that one will adopt a healthier lifestyle outside of the office. In fact, considering Hodzic et al.'s (2021) findings on fatigue, this may mean that the physically active work requirement may be leaving employees too tired to engage in health-promoting behaviours outside of work and leads them to engage more in sedentary, negative health behaviours instead.

Question 3: What has recent literature found regarding gender differences in the effects of office designs?

As we see with literature on activity-based working, the effects of gender differences as a moderating variable have been relatively lacking in research pre-2016. However, unlike literature on activity-based working, gender differences have continued to be fairly ignored. Our current review only identified three studies, from Sweden (2) and New Zealand (1), which specifically looked at gender differences. According to Stats NZ (2019), women in 2019 made up 48% of the current paid workforce as of 2019, a six percent increase from statistics recorded in 1986. With nearly half the New Zealand workforce comprised of women, it immediately indicates that this remains to be a significant gap in the literature.

One trend noted from these studies were that men overall did not seem to be affected by changes in office design or stimuli, compared to women, except when it came to incidents of status within the workplace. It appears that when aspects of an office design, such as assigned work desks or size of an assigned workstation, are seen as inadequate for the perceived status held, male individuals tend to rate lower on various psychological outcomes, such as job satisfaction and work environment satisfaction. This also led to them rating lower on their indications of perceived status, showing that these stimuli also led to changes within their own perceptions of the status they hold within the office.

Most noted gender differences saw women generally being more affected by stimuli than men, whether it be noise, distractions, or even aspects of the design (i.e., hot-desking); a trend suggested by Danielsson (2016) as well. This suggestion does parallel with common assumptions of a greater sensitivity to various stimuli and is also supported by Xin et al. (2022), who found higher reported psychological sensitivity in females. Thus, this opens the possibility that perhaps across all measures of researched, negative psychological and work outcomes related to office designs, women may be significantly more affected than males. Nevertheless, research is still lacking, and this gap needs to continue to be addressed.

Question 4: What new themes have emerged since 2016?

The Applications of Office Types into Specific Occupations

One new focus of recent literature our review has spotlighted is the applications of certain office designs (mainly open offices) to specific occupations: Social Workers (Jeyasingham, 2016), Architects (Weziak-Bialowolska et al., 2018), Academic Staff (Van Marrewijk & Van den Ende, 2018), and University Students (Braat-Eggen et al., 2017). The aims of these were to assess the design-to-task fit for these occupations. However, as a whole, relevant studies from our reviewed list seems to have indicated the fit to be ill-suited, for the most part. Again, this brings forth the suggestion that modern companies and organisation are not making well-informed and considered decisions but may instead be made due to cost-effective reasons. General findings across our four identified studies largely showed negative outcomes for employees; although Jeyasingham (2016) did note positive increases in autonomy and the ability to observe, learn, evaluate, and collaborate. These negative outcomes included the predicted increases in distractions, noise, and a lack of privacy, leading to feelings of job dissatisfaction. However, additional negative outcomes such as irritability and an inability to focus on complex, high cognition tasks were also noted. Although these findings seem to simply be in line with other studies focusing on open-plan offices, a suggestion that can be propose is that perhaps open-plan offices are not appropriate fits for these noted occupations.

Another thought to be considered is of the confidentiality and privacy requirements of certain occupations and the inappropriate utilisation of open-plan offices. The work done by social workers, within Jeyasingham's (2016) study, can be seen as highly sensitive as due to the nature of the occupation and the clients they see. An open-office design can be highly unethical due to the lack of privacy which may lead to the inability to guarantee the confidentiality of the cases being worked. This suggests that considerations for the suitability of open offices need to be thoroughly addressed by companies, especially those in the healthcare profession, such as social workers and therapists.

Office Types and Perceived Fit

The psychological outcome of perceived fit is another theme which has been of interest in recent literature. Essentially, this can be defined as the perceived fit of the office design to employees and the needs of their work (Soriano et al., 2020). An example of good perceived fit may be found in an office type that provides privacy and a quiet work environment when their employees are required to complete high concentration tasks. On the other hand, low perceived fit or misfit may be seen in offices that do not provide these environments for similar tasks. This concept has been found to be a significant mediating variable which sees potential negative outcomes mitigated, while ameliorating positive and desired outcomes. In the studies aiming to record the applications of open offices to specific occupations, it can be suggested that these findings were due to the perceived ill-fit of the office space to their work demands, this was also noted in Weziak-Bialowolska et al.'s (2018) participants. This can also be extended to suggest that perhaps all noted outcomes associated with

office designs can and are moderated by the perceived fit of the employees working withing them. However, these potential relationships will require future consideration.

This concept is also approached through the consideration of personality traits that moderate the relationships between office types and psychological outcomes. Specifically, our review highlights four of the Big-5 Personality traits (Agreeableness, Openness, Neuroticism, and Extraversion; Fiske, 1949) which correlate to office-related psychological outcomes. To summarise, high agreeableness and openness were positively associated with higher levels of reported distractions. Neuroticism was seen to negatively moderate the relationship between office design and perceived control. And lastly, extraversion may hold a positive moderating effect in the relationship between visual exposure/lack of spatial boundaries and perceived performance. One personality trait of the Big-5 not included in our review is conscientiousness. This can be characterised by high levels of thoughtfulness, goal-driven behaviours, and positive impulse control (Fiske, 1949). One plausible dynamic that may exist is that conscientiousness positively moderates the relationship between activity-based working offices and job satisfaction. It is conceivable that characteristics of conscientiousness will mean one holds the necessary tools to work well within an activity-based working office and enable one to easily adapt to the more active environment if making the shift from an open or closed office.

Overall, perceived fit can be seen as an outcome variable itself, and a concept that considers the fit of personality traits to the office layout. As an outcome variable, perceived fit can be suggested to play a significant mediating role in that can determine whether employees are experience an office layout as positive or negative. On the other hand, the fit of specific personality traits to a particular office design is also interesting to consider. From findings highlighting the Big-5 traits, individuals who are rated highly on openness and agreeableness may struggle to perform and concentrate within open-plan offices. While those who rate highly on extraversion may find that they are performing well within an open office. Additionally, it may be seen that those high on neuroticism may struggle to adapt to new office layouts and may even struggle specifically in activity-based working due to a lack of control.

Morrison and Smollan's (2020) article provides evidence for how office designs can be perceived positively if the implementation is well-thought out and carefully created. Office designs that wisely consider the needs of the employees, and of the job, can see potentially negative outcomes minimised, creating a generally positive-perceived work environment. However, despite all the positive outcomes from this project, Morrison and Smollan (2020) also highlight that the office design cannot be designed to fit and accommodate every individual within the office. Despite their best attempts to mitigate the perceived lack of privacy in their open-plan office design, some individuals still reported privacy to be an issue. Nevertheless, considerations for the perceived fit of the office design can still produce positive outcomes holistically.

Apparent Gaps in the Literature

Cultural differences

It is notable that studies within this field have covered a large range of countries and cultures around the world. However, studies originating from Asian, community-based cultures (i.e., Korea, China, and Japan) have been found to be severely limited, only comprising of three notable studies (Inamizu & Makishima, 2019; Lee et al., 2016; Lin & Chang, 2020). Moreover, two of these studies have found contradictory evidence against the common themes found in western societies. Lin and Chang (2020) found no relationship between the physical work environment and employees' creativity. While Lee et al. (2016) also found that the relationship between noise disturbance and job satisfaction was not significant. This points to a potential cultural difference whereby individuals within community-based cultures perhaps do not experience the same effects of the physical office designs.

On the other hand, this trend may simply be a product of alternative research aims and findings that these studies are looking to answer, and the perceived trends may just be a coincidence. Lin and Chang (2020), for example, found that rather than a direct causal relationship, physical work environments and employees' creativity were mediated by positive moods held by employees; a notion that has not been previously considered. Showing that if a design or organisation was able to foster a positive environment, negative effects could plausibly by marginalised. Additionally, Lee et al. (2016), found that rather than a direct relationship between noise disturbance and job satisfaction, noise privacy acted as a mediator between them. Whereby high or prolonged noise disturbance leads to lower perceived noise privacy, which in turn leads to a lower rated job satisfaction. These outcomes are common topics of interest of many western literatures, and perhaps this interconnected dynamic has not been considered. Thus, perchance, it is coincidental that these new relationship dynamics have both been revealed in studies from eastern cultures. Researchers from Asian cultures may simply be approaching the relationship between psychological outcomes and office designs from a different viewpoint; seeing the design as a facilitating factor that is enabling certain conditions which, in turn, are having a direct effect on certain outcomes, such as privacy and creativity. However, our sample size is insufficient, and this current study has simply highlighted a gap in the literature that needs further addressing.

Potential Impact of Sample Local

One final trend to highlight is the high number of studies originating from Central European nations, specifically from Sweden (9). Around 39.5% of included studies originating from Sweden, Netherlands, and Germany. The latter represents the 5th largest economy in world rankings (Silver, 2022), accounting for 4.39% of the global economy, but only contributes three articles to our collection. Moreover, of the top three largest economies (USA, China, and Japan; Silver, 2022), only

the USA contributes a significant portion of studies (6). It is reasonable to suggest that countries with large global economies hold significant working populations of interest, meaning that studies from China and Japan may essentially hold higher social/global importance than those originating from countries with smaller economies, such as Finland (3) and Australia (1), both of whom fall outside the list of top 25 global economies (Silver, 2022). If suggestions of differing felt effects by collectivist cultures are true, this could mean that a substantial portion of the global workforce may be currently unaccounted for in current literature.

Limitations

One limitation of our current review is in its exclusion of studies not written in English. Although Figure 1 indicates that only three studies did not meet this inclusion criteria, these three studies could have contained findings that were imperative to our review. Additionally, this current review noted several gaps in recent literature as well as directions for future research. It is possible that one of these excluded articles could have provided initial answers to these questions.

There are various different office types available across modern offices. Danielsson (2016) identified seven different office layouts that exists within contemporary office, which does not include activity-based working offices: (1) cell/closed layout offices; (2) shared-room offices; (3) small, (4) medium-sized and (5) large open-plan offices; (6) flex-offices and (7) combi-offices. This current review chose to focus solely on cell offices, open-plan office (no distinguishes between size), and the activity-based working office. This was due to our belief that that these three office designs represent most of the available, recent research and held the most social significance. However, Danielsson (2016) noticed differences in findings between their noted offices and even highlighted significant differences between small and large open-plan offices. This shows that perhaps this decision may have been an oversight on this study's part and a significant limitation in our research design.

Lastly, in 2020, the Coronavirus (Covid-19) pandemic hit and created a significant impact on the lives and lifestyles of all persons across the world. As a result, many governments around the world imposed strict lockdowns on their population, requiring many organisations and companies to cease operations and for most of the population to remain in their homes for prolonged periods. "Social Distancing" protocols were soon applied to ensure the avoidance of physical contact through a minimum distance to be kept between individuals and groups that minimise the risks of community transmission of the disease (New Zealand Government, 2020a). This protocol required the shift of office workers to move from working within an office to working at home. Since then, Covid-19 guidelines around the world has generally been relaxed or removed as the world attempts to return to "normalcy"; the COVID-19 Protection Framework ended in New Zealand in September 2022 (New Zealand Government, 2020b). However, working habits and the office environment have yet to return to pre-covid normalcy, with many individuals now choosing to work from home permanently or part-

time. With this being said, a key limitation of our study design is the omission of the effects of the Covid-19 pandemic. Although some literature of on these effects have been published (i.e., Parker, 2020), out review did not include findings on these effects. A possibility does exist that post-covid times may see a change in noted effects relating to the office design. For example, after two years of social distancing, open offices may now be associated with increases in anxiety as the design may bring up perceptions of exposure and the risk of infection; especially if these open-plan offices are small in its spacing between workstations. Already, Parker (2020) noted hot-desking open-offices to be a threatening breeding and cross-contamination ground for bacteria and viruses, due to the sharing of workstations. Thus, a future review of literature summarising the effects of post-Covid-19 offices may be significantly needed.

Conclusion

It has become evident that findings on the psychological effects of office designs are contradictory and the topic is one that holds many complex considerations. Although recent literature has highlighted new and interesting psychological outcome associations with the differing office types, it has also produced findings that contrast older results and created new approaches to certain relationship dynamics. This scoping review has also highlighted the numerous new literatures on activity-based working as it continues to be implemented more in contemporary offices. New themes and directions of the most recent literature have also been highlighted and it holds promise as significant and key directions that research has turned to and will continue to expand.

This scoping review has highlighted gaps in the literature relating to cultural differences and a skewed sample local of recent literature, but also that gender differences continue to be a gap that needs to be further addressed. Future implementations of specific office types should be carefully considered and that the fit of the design to match the requirements of the occupation and the individuals is the key to creating a positive work environment. However, as Covid-19 has drastically shifted the perceptions and lifestyles of most individuals, the possibility exists that the utilisation of past literature may not be appropriate in accounting for all possible outcome variables and future literature needs to continue to address this change to support the new world that we live in. Thus, results may seem to still be inconclusive, but this current study has highlighted the importance of considering the context of the employee, and that it plays a major role in how office types will be perceived.

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Appendix A

Author(s)	Year	Location	Office Type	Key Themes	Outcomes
Eismann, Pakos, Rücker, Meinel, Maier, & Voigt	2022	Germany	ABW	Collaboration, Creativity, Distractions, Concentration, Stress	• Increased social interactions caused by ABW design led to wider collaboration. • ABW led to more distractions, making concentration at times more difficult, and an increase in stress levels. • Greater exposure to interactions and information lead to increases in new ideas/solutions, which made individuals feel more creative
Sivunen & Myers	2022	Finland	OPO	Spatial Visibility, Making Attachments, Inclusion and Worth	• Increases in Spatial Visibility created perceptions of inequality by exposing some workers' spatial limitations and other constraints, reducing their feelings of inclusion and worth to the company.
Bäcklander, Fältén, Danielsson, Toivenen, & Rickter	2021	Sweden	ABW	Workday Planning (WP), Environment Crafting (EC), Social Needs Prioritisation (SNP)	• Increases in individual's WP associated with higher levels of concentration • EC was associated with an increase in general health and lower reported stress levels. • SNP also related to increase general health, as well as increase in work engagement.
Sander, Marques, Birt, Stead, & Baumann	2021	Australia	OPO	Noise, Cognitive Performance, Well-Being	• Increase noise levels in OPO did not immediately reduce performance in cognitive tasks. • But it did reduce reported levels of psychological wellbeing • Found no relationships between office design and employee engagement, work stress, and job satisfaction.
Passini	2021	USA	General Office Designs	Noise, Privacy, Distractions	• Office design is strongly related to the amount of noise, distractions, and privacy that employees experience. This is moderated by the perceived openness of the office design.
Halldorsson, Kristinsson, Gudmundsdottir, & Hardardottir	2021	Netherlands	ABW	Privacy, Psychological Ownership	• Implementing ABW environments can negatively affect privacy and psychological ownership.
Öhrn, Wahlström, Harder, Nordin, Pettersson-Strömbäck, Danielsson, …, & Slunga Järvholm	2021	Sweden	ABW / Cell Offices	Productivity, Satisfaction, Health, Privacy, Concentration, Stress	• Employees in ABWs experienced decreased productivity and satisfaction. Lack of privacy, as well as increased noise disturbance, less satisfaction with sit comfort and work posture were reported. • Employees with high concentration work tasks experienced lower productivity while those with a high proportion of teamwork rated productivity to be high. • No significant differences were found between ABWs and Cell Offices in general health and cognitive stress.
Soriano, Kozusznik, Peiró, & Demerouti	2021	Netherlands	General Office Designs	Flow, Work Patterns, Perceived Fit	• Workspaces that fit employees' work patterns are more likely to encourage flow, which will have beneficial consequences for the organisation
Hodzic, Kubicek, Uhlig, & Korunka,	2021	Austria	ABW	Distraction, Work Engagement, Job Satisfaction,	• Moving into an ABW had negative effects on distraction, work engagement, job satisfaction, and fatigue.

				Unpredictability, Time Pressure	• This was moderated negatively by increases in time pressure and unpredictability.
Jancke & Hall	2020	Sweden	ABW / OPO / Cell Offices	Cognitive Performance	• Performance in Cognitive Tasks were better (17%) in cell offices compared to OPOs. • In ABWs, performance was better (17–22%) in quiet work zones/rooms compared to active zones.
Pitchforth, Nelson-White, van den Helder, & Oosting	2020	Netherlands	ABW / OPO	Noise	• Compared to ABW and other office types, OPOs performed poorly, when rated by employees, and had higher levels of noise.
Morrison & Smollan	2020	New Zealand	OPO	Gender Differences, Privacy	• A gender difference occurred whereby female, but not male, employees in OPOs reported feeling observed
Lin & Chang	2020	Taiwan	ABW	Creativity, Positive Mood	• Perceived architectural details of the physical work environment do not have a direct effect on occupants' creativity, but rather, it is mediated by positive mood.
Davis, Leach, & Clegg	2020	United Kingdom	ABW	Ease of Communication, Job Satisfaction, Well-Being	• Breakout Areas/Active Collaboration rooms in ABW design related strongly to increases in ease of communication, higher job satisfaction, and well-being. • This is moderated by an individual's autonomy, which sees an increase result in a better ability to better manage and adapt to challenges.
Soriano, Kozusznik, Peiró, & Mateo	2020	Spain	General Office Designs	Well-Being, Performance, Perceived Fit	• Perceived Office Fit is an important moderator for the relationship between Well-Being and Performance • Results show no relationship between office type and outcomes: cognitive stress and performance.
Bäcklander, Falkman, Stenfors, Seddigh, & Stenström	2019	Sweden	General Office Designs	Performance, Stress, Information Richness, Self-Leadership	• Information richness and self-leadership had a large negative relationship with cognitive stress. • Information richness and self-leadership had a large positive relationship with performance.
Hoendervanger, Van Yperen, Mobach, & Albers	2019	Netherlands	OPO	Task Performance, Job Satisfaction. Perceived Fit	• High-complexity tasks do not fit well with OPO settings. • Perceived fit affects task performance and satisfaction with the work environment.
Monaghan & Ayoko	2019	Australia	OPO	Personalisation, Affective Environment	• Employees' personalisation in OPO is driven by the nature of their tasks, appointment, duration of time spent on their desk, level of adaptation to the OPO configurations, and the proximity of desks to senior managers, hallways, and passers-by. • Affective environment has a critical effect on employee personalisation and perceptions of territoriality in OPOs.
Wohlers, Hartner-Tiefenthaler, & Hertel	2019	Germany	ABW	Perceived Fit, Job Attitudes, Vitality, Management Trust, Routine Seeking	• ABWs that support undisturbed working was positively related to job attitudes and vitality. • In ABWs that support communicative work, job attitudes and vitality were additionally explained by the relative fit to the task and appropriate use of ABWs. • Perceived appropriate fit of ABWs were positively correlated with trust in management and negatively correlated with a need for routine seeking.

Inamizu & Makishima	2019	Japan	ABW / OPO	Privacy, Various Zoning	• Study found that OPOs themselves do not have a major impact on privacy (they neither improve nor worsen privacy); rather, various zoning is what improves privacy. • Furthermore, privacy dramatically worsens in OPOs without any various zoning, and vastly improves in ABWs, where various zoning has been implemented.
Yıldırım, Güneş, & Yilmaz	2019	Turkey	General Office Designs	Privacy, Workstation Partition Height	• Privacy in an office can be moderated by the height of the workstation partitions. • Higher partition heights were correlated with an increase in privacy.
Danielsson & Theorell	2019	Sweden	ABW / OPO	Gender Differences, Supportive Facilities, Workplace Satisfaction	• Less satisfaction with workspace contribution in OPOs and ABWs where employees share workspace and facilities than in Cell Offices. • Those with the lowest ratings of access to supportive facilities reported the lowest degree of satisfaction. • Men less satisfied with workspace in small OPOs compared to women. • High unpleasantness reported with ABWs for both genders, but influence is stronger in women.
Engelen, Chau, Young, Mackey, Jeyapalan, & Bauman	2019	Australia	ABW	Job performance, Communication, Control of Time and Space, Workplace Satisfaction, Health	• ABWs has positive merits in terms of interaction, communication, control of time and space, and satisfaction with the workspace. But is unfavourable in concentration and privacy. • There is some benefit for work performance and perceptions of the work environment, mediated by adequate management support and organisation. • Ambiguous evidence for potential health benefits.
Haapakangas, Hallman, Mathiassen, & Jahncke	2019	Sweden	ABW	Communication, Loss of Privacy, Community	• Negative reactions to ABWs are more common when moving there from cell offices. Problems in finding people at an ABW may impair communication and sense of community.
Węziak-Białowolska, Dong, & McNeely	2018	USA	OPO	Privacy, Distraction, Job Satisfaction, Perceived Fit, Irritability, Specific Application	• Study looked at the application of an OPO to an architectural firm. • OPOs limits privacy and increases perception of intrusion among employees, negatively correlated to job satisfaction, work engagement, and internal work relation, and an increase in the number of limited ability days. • Positive correlations found with expressive personal relations among co-workers and job performance. • Negative emotions (irritability and perceived fit) played mediating roles.
Van Marrewijk, & Van den Ende	2018	Netherlands	OPO	Creativity, Collaboration, New Work Practices, Specific Application	• Study looked at the application of an OPO to academic university staff. • Change to OPO found an increase in creativity and collaboration, as well as an increase in noise and lack of privacy. This change also led to a change in the work practices held by office occupants.
Haapakangas, Hongisto, Varjo, & Lahtinen	2018	Finland	OPO	Distraction, Collaboration, Stress	• Distractions are a central source of environmental stress in OPOs. Increased distractions mediated the effects on collaboration and stress. • Quiet workspaces, and the perceived ease of access to them mitigated the effects of

					distractions.
Rolfö, Eklund, & Jahncke	2018	Sweden	ABW	Noise, Privacy, Communication, Performance, Workplace Satisfaction	• When shifting from an OPO to ABW, results showed that satisfaction with auditory privacy and background noise increased significantly. Negative outcomes (lack of communication) were perceived as being due to the high people-to-workstation ratio and lack of rules. • Overall satisfaction with the physical work environment increased in the ABW compared to the OPO. • Perceived performance did not change significantly.
Bernstein & Turban	2018	USA	OPO	Face-to-Face Communication, Collaboration, Social Withdrawal	• Volume of face-to-face interaction decreased significantly when shifting from Cell Office to OPO. • OPO architecture appeared to trigger a natural human response to socially withdraw from officemates and interact instead over email and instant-messaging, reducing collaboration.
Jegen & Chevret	2017	France	OPO	Noise	• How the level of noise is perceived is dependent on the specific type of OPO, and the expected noise level of the occupation.
Braat-Eggen, van Heijst, Hornikx, & Kohlrausch	2017	Netherlands	OPO	Noise, Cognitive Tasks	• Study shows that 38% of the surveyed students are disturbed by background noise in an OPO. • Students are mostly disturbed by speech when performing complex cognitive task.
Kegel	2017	USA	General Workspace	Creativity, Performance, Productivity, Job Satisfaction, Noise, Well-being, Gender Differences, Privacy	• A Systematic Review • Noise levels impacted male productivity more than female productivity. • Privacy has strong influence on productivity and performance. • OPOs and AWBs promote creativity through removal of barriers and increase collaboration.
Zerella, Von Treuer, & Albrecht	2017	Australia	General Office Design	Organisational Culture, Job Satisfaction, Attitudes	• Office layout features were significantly and positively associated with ratings of organisational culture. • Culture ratings were shown to mediate the relationship between the office layout features and job satisfaction. • These suggest that perceptions of office layout can influence employees' perceptions of the organisational culture and important employee attitudes.
Wohlers & Hertel	2017	Germany	ABW	Health, Performance, Workplace Satisfaction	• A Systematic Review • Findings found mixed effects of ABWs on health, performance, and workplace satisfaction. • More emotionally stable participants reported lower distraction, particularly those working in ABWs.
Seddigh, Berntson, Platts, & Westerlund	2016	Sweden	ABW / OPO / Cell Offices	Distraction, Job Satisfaction, Job Performance, Big-5 Personality	• Both agreeableness and openness to experience were associated with higher levels of distraction among employees in OPOs compared to Cell Offices. • No correlation between Big-5 traits and Job Satisfaction or Job Performance.
Smith-Jackson, Middlebrooks, Francis, Gray, Nelson, Steele, ...,	2016	USA	OPO	Noise, Speech Interference, Cognitive Task Performance	• The results of this study were mixed. • The complexity of studying OPOs from an empirical and within a real-world perspective continues to be a challenge.

& Watlington					• The experience of employees within office environments does not impact performance or mental workload under distracting conditions.
Danielsson	2016	Sweden	ABW / OPO	Gender Differences, Perception of Leadership, Job Satisfaction	• Employees working in small OPOs, followed by those in ABWs, are less satisfied with their closest supervisor, compared to those in medium-to-large OPOs. • Job Satisfaction negatively associated with ABWs and OPOs. • Greater sensitivity for environmental stimuli among women than men.
Engelen, Dhillon, Chau, Hespe, & Bauman	2016	Australia	ABW	Health, Productivity, Workplace Perception	• In ABWs, employees showed less work time sitting and more time standing. Participants ABWs as more stimulating, but noisier and providing less storage. • No differences were reported in changes to positive, health-behaviour activities or productivity. • The relationship between noise disturbance and job satisfaction was not significant.
Lee, Lee, Jeon, Zhang, & Kang	2016	United Kingdom / Korea / China	OPO	Noise, Job Satisfaction, Privacy, Satisfaction with Environment (SwE)	• Job satisfaction and SwE were negatively correlated with lack of speech privacy. • Speech privacy was positively associated with noise sensitivity, and longer noise exposure led to decreased job satisfaction. • Evidence that speech privacy was a stronger predictor of SwE and job satisfaction for participants with high noise sensitivity
Jeyasingham	2016	United Kingdom	OPO	Specific Application, Collaboration	• Application of Hot-Desking OPO to Social Work Organisation. • Provided social workers with significant amounts of autonomy about how they practised and enabled them to observe and evaluate the practice of others and collaborate. • However, ABW afforded feelings of a loss of comradery and a lack of privacy
Leder, Newsham, Veitch, Mancini, & Charles	2016	Brazil	OPO	Job Satisfaction, Noise, Speech Privacy, Workspace Size	• Noise and privacy were most strongly affected by workstation size and office type • In OPOs, the size of the workstation is a significant predictor - with larger workstations associated with greater workplace satisfaction
Lindberg, Tran, & Banasiak	2016	USA	General Office Design	Big-5 Personality, Performance, Well-Being, Perceived Control	• Neuroticism moderated the relationship between Office Design and perceived control – high neuroticism associated with less control over open workspaces and lower perceived performance. • Extroversion may play a moderating role in the relationship between exposure and perceived performance.
Hongisto, Haapakangas, Varjo, Helenius, & Koskela	2016	Finland	OPO	Workplace Satisfaction, Privacy, Noise Privacy	• Improvements in both noise and visual privacy were found to significantly improve workplace satisfaction.

Appendix A. Included Studies

Note. ABW = Activity-Based Working, OPO = Open-plan Offices,