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Factors influencing employees' eating behaviours in the office-based workplace: A systematic review

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Abstract

Employees spend a large proportion of their time at work and typically consume a third of their total calories during the working day. Research suggests that the workplace environment can affect employees' eating behaviours, leading to various related health consequences. This systematic review aimed to identify and synthesise the evidence surrounding factors influencing eating behaviours within an office-based workforce. The literature search was restricted to studies published in English between January 2008 and April 2018. A total of 5,017 articles were screened and assessed for eligibility, of which 22 articles (n=23 studies) were included in the review. All included studies were subjected to quality assessment and were summarized into groups (themes) of 'factors' affecting any aspect of eating behaviour at work. The findings revealed a number of factors influencing eating behaviours at work relating to the job role, workplace food environment and social aspects of the office-based workplace. Most of the existing research implies the office-based workplace has a negative influence on eating behaviours. The findings of this review provide an evidence based, comprehensive summary of the possible determinants of eating behaviours in the workplace, which may help researchers to identify factors that are potential targets for intervention.

Working adults spend up to two thirds of their day in the workplace and there is a growing pressure from the UK government for organizations to better support the health and wellbeing of their employees (see 'Thriving at work' report ¹) ². Given that a typical working adult consumes approximately a third of their daily calorie intake in the workplace eating behaviours have been identified as a key determinant of employees' wellbeing and productivity³⁻⁸. Eating behaviours is a broad term which encompasses a variety of decisions including; *what* an individual chooses to eat (type of food), *how much* they eat (e.g. portion size), *when* they eat and *how* they choose to eat (e.g. eating alone/or with others) ⁹. In the short term, a diet low in nutrient-rich foods can affect employee's levels of concentration, mood and performance (e.g. among pilots and students) ^{3,6,7,10,11}. In the long term, an unhealthy diet can contribute towards obesity, which can significantly increase the risk of cardiovascular disease, cancers, type 2 diabetes and a number of mental health problems ¹²⁻¹⁴. As discussed in a recent systematic review, obesity at work has been associated with increased levels of absenteeism, reduced productivity, and higher costs for organisations ¹⁵⁻¹⁷.

Recent research has focused on interventions aimed at physical inactivity, specifically reducing the amount of time spent sitting among office-based employees ¹⁸. Indeed, office workers have increased risk of physical inactivity compared with other manual professions, with full time office workers spending up to two thirds of their working day sitting down ^{18,19}. However, weight management is the result of total energy balance and given that eating behaviours contribute to it alongside physical activity, it is important to address eating behaviours of workers too. Additionally, with rising levels of automation of labour (e.g. Industry 4.0) and steady increase of office-based jobs, it is important to identify any specific factors in an office environment that impact on eating behaviours ^{9,19}. Taken together, there is a growing need to provide a better understanding of the barriers and facilitators of healthy eating among the predominantly sedentary workforce. This is the objective of the present systematic review.

The workplace also offers an interesting context for studying eating behaviours. There is often a high level of consistency in people's working lives, with many workers (particularly those who are office-based) spending most of their time in the same location surrounded by the same group of colleagues²⁰. Partly for this reason, a number of eating-related research has been conducted in organisations^{16,21,22}. Workplace eating interventions have typically focused on individual behaviour change, motivational interviewing and nutritional education¹⁶. However, previous systematic reviews of workplace dietary interventions have reported only moderate positive effects of such programs^{16,23,24}. One of the key challenges for interventions is the heterogeneity of factors affecting eating at work, which makes it difficult to accurately identify "what works" about a single intervention program^{25,26}. More recently there has been an increase in interventions focusing on modifying elements of the workplace environment to increase healthy food choices. A recent review concluded that, despite some studies reporting positive changes in eating behaviour at work, poor reporting of interventions and control conditions made it difficult to evaluate their effectiveness¹⁶.

In order to develop effective workplace interventions for healthy eating, researchers must first consider all of the known determinants of eating behaviour as potential targets for intervention, such as distinct features of working conditions. In a recent systematic review of factors affecting healthy eating among nurses, the majority of studies found that workplaces often create barriers to healthy eating²¹. Nicholls *et al.*²¹ categorised those into four distinct themes: workplace environment (e.g. availability of healthy food in the workplace canteen), social influences at work (e.g. pressure from colleagues), individual factors (e.g. nutritional knowledge) and organisational related barriers (e.g. work stress). All of these categories of factors have been found to be positively associated with the overconsumption of unhealthy foods high in sugar, salt and saturated fats among nurses²¹. Jobs in the health-care sector often involve late night shift patterns and, arguably, are more physically demanding compared to the work of those who spend most of their time sitting

at their desk^{21,27}. Therefore, the findings of previous reviews are unlikely to be generalizable to other, more sedentary occupations such as office-based white-collar positions²¹. Given that many employees work in office-based roles, there is a need to consider the full range of work-related factors that might affect employees eating behaviours.

In summary, what one consumes and how one eats at work can affect physical health, wellbeing and work performance^{3,7,8}. A previous review investigating the eating behaviours of nurses found that the majority of studies reported barriers to healthy eating and few facilitators²¹. However, a review of those factors affecting the eating behaviours of office-based workers is yet to be conducted. Therefore, the primary aim of this systematic review is to identify and critically evaluate the evidence for specific factors that influence work-based eating behaviours by office workers.

Methods

- An electronic literature search was carried out using the following databases: PsycINFO, Medline and CINAHL. On the basis of the initial scan of the relevant literature, a decision was made to limit the scope of the review to articles published between January 2008 and April 2018. Nine key terms were used to search for relevant articles (workplace* or "work place*" or "work site" or worksite or work or employee*) AND ("eating behavior*" or diet or eating). Search terms were restricted to title, abstract and keywords. The reference lists of all included articles were searched to ensure all relevant articles were included in the systematic review. A detailed search strategy is provided in supplement 1, table S1.

Selection criteria

Studies were eligible if they met the following criteria:

- Population: Only studies with white-collar workers, or studies in which majority of workers are white-collar workers (a minimum of 50% and above, based on the sample description) working in an office environment in jobs that generally do not involve manual labour (e.g., bus drivers, nurses) were included (the same inclusion criteria as was applied by Chu *et al.*¹⁸). Studies in which it was impossible to unambiguously determine the distribution of occupational roles of participants were excluded (e.g., Mazzola *et al.*, Tamers *et al.*^{28,29}).
- Workplace setting: The review was limited to studies conducted within offices. Studies that utilised office-based workers that were conducted elsewhere (e.g. at home) were not included (e.g., Hagger-Johnson *et al.*, Tabak *et al.*^{30,31}). In addition, studies were excluded if they didn't clearly specify the workplace setting (e.g. Thomas *et al.*³²).
- Study design: Qualitative and quantitative studies were included, but systematic reviews, meta-analyses, and literature reviews were excluded. It is worth noting that many studies included in the review were intervention studies. Tests of interventions to improve healthy eating provide empirical evidence for factors that are likely to drive poor or good eating behaviours.
- Language: only articles published in English were included.
- Eating behaviours: Primary outcome(s) of the studies included in this review were eating behaviours. As per our definition of eating behaviours (see our introduction), these included (i) objective measures of change in eating behaviour (e.g. change in consumption of fruit/vegetables eaten in workplace canteen meals) ii) objective measures of food choice (e.g. snack choice) (iii) objective measures of food consumed (e.g. amount of fruit and vegetables consumed) (iv) observational measures of food choice (e.g. snack choice) (v) subjective measures of eating behaviour (e.g. self-reported fruit/vegetables consumed, self-report of eating habits at work e.g. eating lunch with colleagues/eating alone), and (vi) subjective measures of change in eating behaviour (e.g. self-reported increase of fruit

consumed at work). Any studies based in an office but which had assessed eating behaviours generally, with no reference to eating behaviours in the workplace, were excluded (e.g. Setto *et al.*, Tsiga *et al.*, Van Strien *et al.* ³³⁻³⁶). Studies investigating physical activity alongside eating, or multi component lifestyle interventions were included as long as eating behaviours at work were reported separately in the results section.

- Only peer reviewed, published articles were included.

Article Screening

The first author (SC) developed the search strategy and conducted the database searches, identifying and collating all potentially relevant articles. The first author then screened all titles and abstracts of identified articles against the inclusion and exclusion criteria. Full texts of potentially eligible studies were then retrieved. When there was uncertainty regarding inclusion/exclusion of a specific paper, the other authors were consulted (CM, LW) until unanimous agreement was reached.

Data Extraction and Synthesis

The following information was extracted from each study by the first author; the study design, study aim(s), sample, country, measures, results, conclusions, limitations. The review and narrative synthesis was guided by the PRISMA statement for systematic reviews ³⁷. Due to the heterogeneity between studies' methodologies, a meta-analysis was not considered appropriate. The primary goal of the analysis was to extract factors that influence eating behaviours among office-based workplaces. Factors here are defined as any aspect of the office workplace that might have an effect on some aspect of eating behaviours in the office environment, e.g. correlates, mediators, self-reported disclosure of factors in questionnaires/qualitative studies, observations,

etc. Examples of factors might relate to the workplace environment, job role or colleagues. In order to group these into themes, a qualitative evidence synthesis was performed jointly by all authors.

Quality assessment

For the purposes of this study, an existing checklist for quality assessment of qualitative and quantitative studies was used³⁸. An overall quality assessment score was calculated for each study, with scores of 0-3 indicating low quality, 4-6 moderate quality and 7-9 high quality. Study quality was independently assessed by a second reviewer (following suggestions by Moher *et al*³⁷).

Results

The initial database search resulted in a sample of 5,013 potentially relevant articles. A proportion of these were removed due to duplication ($n=823$), and some additional ($n=4$) articles were identified through other sources (e.g. internet search). The remaining articles ($n=4,194$) were evaluated based on their title and abstract, removing those that were deemed unsuitable ($n=4,001$). The remaining articles ($n=197$) were downloaded for review against the inclusion and exclusion criteria. Following this step, 22 articles (containing 23 unique studies) were included in the final sample.



PRISMA 2009 Flow Diagram

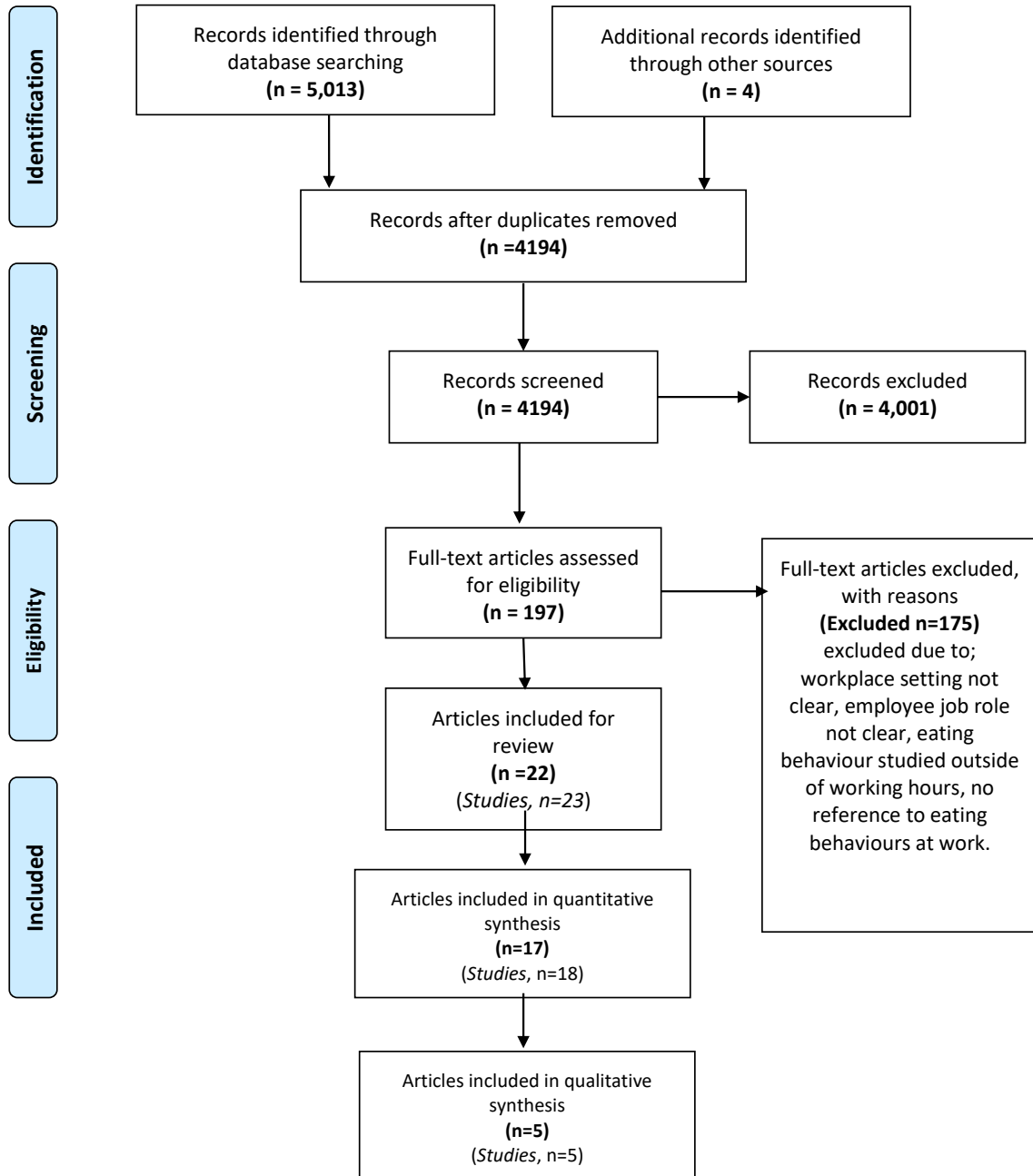


Figure 1. PRISMA flow chart for literature search.

Characteristics of included studies

Studies included in the review often focused on different types of eating behaviour but primarily on a) snacking, b) eating lunch and c) general workplace eating practices. Three studies focused on snacks at work^{22,39-41}. Eight studies focused on eating behaviours and habits at lunchtime⁴²⁻⁴⁸. Eleven studies measured eating behaviours throughout the working day^{4,5,22,26,49-55} and one study measured behaviours around workplace dinner time⁵⁶. For most studies (22 out of 23) eating behaviours were the primary outcome variable. A number of studies covered general eating behaviours at work, and several were qualitative^{4,22,49,51-53,55}. Many studies measured variables related to the workplace canteen; daily energy (kcal) purchased per day^{26,50}, sales of specific lunchtime items⁴⁸ selection of lower calorie vs higher calorie food choices^{43,47}, fruit and vegetable consumption per customer in a canteen meal⁴⁶, amount of a purchased lunch meal consumed⁴² and number of times healthy meal discount card was utilised⁴⁵. Some outcome variables focused on aspects of snacking; including amount of snacks consumed³⁹, type of snacks consumed⁴⁰, or type of snacks selected⁴¹. One study focused on the frequency of lunch breaks⁴⁴, another on the number of workplace dinners participants attended⁵⁶ and another on number of eating occasions during the working day⁵. One study focused on weight loss as the primary outcome, with support for healthy eating behaviours from colleagues as a secondary variable⁵⁴.

Sample sizes of reviewed studies ranged from 14 to 24,596. Most studies were conducted in the USA ($n=9$) and the UK ($n=5$), with the remaining studies conducted in Denmark ($n=2$), Netherlands ($n=2$), Germany ($n=1$), Japan ($n=1$), Korea ($n=1$), South Korea ($n=1$), and Portugal ($n=1$). Out of 23 included studies, five were qualitative studies and 18 were quantitative. Of the 18 quantitative studies, 5 were cross sectional, 5 were longitudinal, 4 were randomised control trials and 4 experimental designs. In terms of recruitment nearly all studies utilised self-selected participants. Of the studies that recorded gender (12/23), 9 of these studies had a larger number of

females participants compared to males. In terms of study quality, quality ratings ranged between 4 and 9 (quantitative studies M= 6.8, qualitative studies M=7.2), indicating they were moderate to high quality. Detailed characteristics for all included studies are presented in supplement 2, table S2.

The following section summarises factors affecting eating at work, which have been categorised into the following categories; *job role factors*, the *workplace food environment* and *social factors*.

Job role factors

The first theme of factors affecting eating at work corresponds to the job role. There are three distinct factors within this category: pressured working environment, work facilitated meals, and work stress. All studies identified these factors as barriers to healthy eating, being associated with an increased consumption of unhealthy foods.

Pressured working environment. In total, five studies (qualitative n=4, quantitative n=1) reported a pressured working environment had a negative impact on eating behaviours at work. Four studies reported that employees felt unable to take a lunch break due to the pressure of completing work tasks^{22,44,51,53}. Qualitative interviews with office workers in South Korea described how a demanding environment in the office encouraged employees to work through lunch and frequently eat lunch at their desks^{22,51}. Additionally, some employees were found to skip a lunch meal altogether to save time^{51,52}. In a qualitative study by Lake *et al.*²², some employees mentioned that 'eating at desk' culture is widespread and likely driven by excessive workload. In addition, some employees went on to say that they eat lunch at their desk so that they do not interrupt their work and can leave the workplace earlier.

Opportunity to eat at work. The review found three studies (qualitative n=1, quantitative n=2) that reported on employees' opportunities to eat at work. For example, one study investigated eating patterns of school employees, as there was a concern that the school environment provided

staff with limited opportunities to eat⁵. Contrary to the authors' predictions, the study found that school employees ate very regularly— 37% of participants' daily energy intake was from food consumed at work and an average of two eating occasions were reported during the working day. Different results were reported in a qualitative study by Payne *et al.*⁵², who found that some participants believed they ate a lot less during the working day compared to out-of-work hours and attributed their under eating to being too busy at work. Another study found that making time for a lunch break, alongside mindful eating and eating with close colleagues increased meal satisfaction for employees, which in turn was associated with a positive mood, lower levels of stress and hunger levels after lunch⁴².

Work facilitated meals. There were three studies (qualitative n=2, quantitative n=1), which reported on how work arrangements directly influence employee's eating behaviour. For example, business dinners tend to be perceived by employee's as a barrier to healthy eating^{51,52,56}. In some organisations, dinner with colleagues was viewed as a continuation of the working day^{51,52,56}. Generally, workplace dinners were associated with unhealthy meals and less autonomy over food choice^{51,52}.

Work stress. There were two studies (qualitative n=1, quantitative n=1) that reported on the role of workplace stress on eating behaviour at work. Overall, work stress appears to increase unhealthy eating behaviours^{40,52}. Sonnentag *et al.*⁴⁰ found that on days when employees experienced more self-control demands at work (e.g. remaining polite when facing a disgruntled customer), they were more likely to eat (consumed greater number of sweets) to regulate their emotions. In contrast, boredom and stress at work was shown to be positively associated with an intake of additional calories at work⁵².

The workplace food environment

The second theme identified in this systematic review corresponds to factors describing the workplace environment. There are four unique factors in this category: availability of healthy vs unhealthy foods in the workplace, food and eating facilities, provision of nutritional information, and cost of healthy options.

Availability of healthy vs unhealthy foods in the workplace. In total, six studies reported on availability of healthy vs unhealthy foods in the workplace (qualitative n=3, quantitative n=3). The results suggest that access to healthy foods in the workplace is often limited, compared to an abundance of unhealthy foods present in workplace canteens, onsite shops and vending machines^{4,39,49,52,53}. Four studies reviewed suggest that workers desire a greater variety of healthy and fresh foods compared to the current offering^{22,49,52,53}. Interestingly, some employees felt that food served in the canteen had not been adapted to suit the nutritional needs of the present workforce. For instance, employees considered canteen food too high in calories, and regarded it as more suitable for physically demanding roles as opposed to office-based roles⁵³.

The proximity of food items also influences consumption of calories at work^{39,52}. For example, in an observational study the authors found that employees who visited a beverage station closer to a snack station were much more likely to consume a snack³⁹. Although no effect was found between relative proximity and time of day on snacking, a marginal main effect of time of day was found indicating that snacking increased as the working day progressed³⁹. Interestingly, participants in a qualitative study by Payne *et al.*⁵² expressed a belief that proximity and time of day combined, increased their consumption of unhealthy snacks. Employees said that they were more likely to eat unhealthy snacks in the afternoon to relieve boredom, and an on-site shop increased accessibility of such snacks. Additionally, employees stated they chose unhealthy options in the canteen because they were convenient and otherwise not available at home (e.g. chips)⁵². Some evidence suggests that employees' BMI might interact with workplace environment in determining eating behaviours in the workplace. One study reported that, in comparison to colleagues with healthy weight,

university employees with overweight or obesity had found it harder to make healthy food choices at work, and were more easily swayed by the unhealthy foods available at the worksite and in the nearby neighbourhood⁴⁹.

However, for some, the workplace is viewed as a facilitator for healthy eating. For example, some employees reported that the lunch provided by the work canteen is the only opportunity to have a 'proper meal' each day⁵². Similarly, providing healthy foods (such as vegetables and fruit) increased intake of those foods^{22,46}. In one such study, participants who were supplied with free fruit during the working day for a total of 18 weeks reported that their consumption of fruits had increased²². What is worrying, however, is that some employees reported they ate free fruit *in addition* to energy dense snacks such as chocolate²². Existing evidence also suggests that decreasing the availability of unhealthy options and providing meals with increased fruit and vegetables in a workplace canteen lead to a sustained increase of consumption of fruit and vegetables over a five-year period⁴⁶.

Food and eating facilities. The importance of food facilities on eating behaviour at work was explored in two studies (qualitative n=2). Availability of facilities where food can be prepared was considered to be an important facilitator of healthy eating by some employees^{22,53}. For instance, a lack of facilities to heat and store food determined what employees consumed for lunch - fewer facilities encouraged cheap and convenient, but energy dense foods such as instant packet noodles. Additionally, limited space where food can be consumed was identified as a reason why many employees purchase unhealthy snacks from the workplace canteen and consume these at their desks⁵³.

Provision of nutritional information. The value of providing nutritional information was explored in five studies (quantitative n=5). In all five studies, information was presented in workplace cafeterias^{26,43,47,48} with the objective of encouraging healthy food choices. VanEpps *et al.*

⁴³ found that traffic light information was more effective in encouraging employees to purchase food items with fewer calories than detailed information about the exact calorie content. Additionally, VanEpps *et al.* ⁴⁷ found that the optimal combination of factors was for employees to order their lunch in advance (participants placed orders any time after 7am and selected a time to pick up any time between 11am and 2pm) and include low calorie labels “under 500” on food products. Contrary to these findings, two studies reported no effects of nutritional labelling on food choices. First, Vyth *et al.* ⁴⁸ conducted a randomised control trial and found no difference in food choice when using a ‘choices’ logo to highlight a healthy food choice. Secondly, Vasilijevic *et al.* ²⁶ reported that the introduction of calorie labelling had no effect on energy (kcal) purchased across six different worksite cafeterias.

Cost of healthy options. In two studies (qualitative n=1, quantitative n=1) the cost of food was explored as a possible determinant of healthy eating in an office-based workplace. In one qualitative study, the higher cost of healthy options compared to unhealthy options was identified as one of the most significant barrier to healthy eating ⁵³. One study experimentally reduced the cost of healthy food options by offering 25% discount card for healthy meals in the workplace cafeteria ⁴⁵. Despite this, the authors found no increase in healthy meals purchased. In fact, participants rarely used their cards (on average 1.5 times per week). Sforzo *et al.* ⁴⁵ concluded that despite eliminating barriers to healthy eating such as cost and inconvenience, other factors (such as motivation to improve one’s eating behaviours) could still prevent healthy eating at work.

Social factors

The final theme identified in this systematic review relates to a range of social factors that have been identified as important determinants of eating behaviour in the office-based workplace.

Overall, nine studies (qualitative n=4, quantitative n=5) identified social influences as having an influence on various aspects of eating behaviour at work. Seven studies reviewed suggest that

colleagues can have both a positive and negative influence on eating behaviours in the workplace^{22,49,51,52,54-56}. Other co-workers who share office space can encourage unhealthy eating behaviours^{22,51,52} but can also be a source of positive cultural and social norms that improve people's choices^{51,52,55,56}.

Two qualitative studies reported that working late often resulted in eating dinner with colleagues^{51,52}. In those studies, participants reported feeling pressured to share unhealthy food with colleagues such as pizza⁵². In one study, celebrations such as birthdays or Christmas were synonymous with a wide availability of cakes, biscuits and chocolates bought into the office by colleagues²². Employees reported increased consumption of unhealthy snacks in such contexts even when they were actively attempting to reduce their weight. Furthermore, it may be the case that some employees are more influenced by colleagues eating habits than others. In one of the reviewed studies, employees who were overweight or obese were more likely to be influenced by the food choices of friends and colleagues compared to employees with healthy weight⁴⁹.

Social norms for eating in the workplace may differ from one culture to another^{51,55,56}. Indeed, in certain cultures there is a greater emphasis towards eating together in the workplace with both African American and Korean communities endorsing the importance of eating with colleagues^{51,55,56}. Yet, South Korean office workers reported feeling pressured to participate in workplace meals (lunch and dinners) with colleagues. In particular, older/senior colleagues often ordered food for a group of subordinate colleagues. Some participants reported the desire to control their weight by choosing their own lunch; however, the desire to be part of the working group prevented them from doing so⁵¹. In other cases, office workers reported skipping a lunch meal altogether if they were unable to eat with colleagues⁵¹.

Colleagues can have a positive influence on eating behaviours^{22,42,54}. For instance, among other factors eating lunch with close colleagues was found to be an important determinant of the

overall meal satisfaction⁴². In turn, greater meal satisfaction was associated with a positive mood, lower levels of stress and hunger levels after lunch. Others who share office space can also facilitate healthy eating in the workplace^{22,54}. For example, social support from colleagues for healthy eating was associated with less weight gain in an intervention designed to prevent weight gain⁵⁴. However, the study also found that friends' support for healthy eating and family support for physical activity predicted improved weight management, therefore it is difficult to establish which one of these support networks had a greater influence on participant's food choices⁵⁴.

Lake *et al*²² conducted interviews with participants in the intervention group of a randomised controlled trial, in which participants were offered free fruit at work for 18 weeks. The authors found that support from colleagues was important in encouraging fruit consumption in the workplace, in particular support from managers. The fruit intervention also appeared to have an impact on office social norms as some participants reported feeling guilty about eating unhealthy foods when its consumption became less widespread²². The intervention also helped to raise important conversations with colleagues regarding BMI and blood pressure, promoting awareness around good health and nutrition. Relatedly, evidence suggests that perceived organisational support is important in promoting a healthy diet at work. Sonnentag *et al.*⁴⁰ found that employees who considered their organisation as supportive of healthy eating were more likely to eat for 'health' rather than as a tool to regulate their emotions.

Discussion

The aim of this review was to examine existing literature and identify factors that have been shown to influence eating behaviour in office-based workplaces. Across twenty-three unique studies published between the years 2008-2018, most factors affecting office-based eating had a negative influence on eating behaviours. Barriers to healthy eating at work included factors relating to job role (e.g. pressured working environment, work facilitated meals, workplace stress); the workplace

food environment (e.g. limited availability of healthy foods, proximity of unhealthy foods, facilities to prepare food) and social influences. Among the most prolific facilitators of healthy eating was the supportive role of colleagues in consuming healthy foods^{22,54} and elements of the physical work environment such as increasing availability and reducing cost of healthy food such as free fruit increasing fruit/vegetables in workplace meals and reducing the number of unhealthy options^{22,46}. Many factors appear to interact, for example workplace boredom and availability of chocolate in an onsite shop or working late and social influence on workplace dinner choices^{51,52}.

Some of the same factors affecting eating behaviours at work were reported in a systematic review of research on eating behaviours among nurses²¹. Consistent with that review, the present review found that environmental factors (e.g. limited availability of healthy food options, inadequate preparation areas) and colleagues can have both a negative^{39,51,54} and positive effect on eating behaviours^{22,54}. One of the new insights from the present review is that some office-based workers reported eating less during busy and stressful periods at work^{51,52}. This is concerning as undereating at work may have adverse effects on concentration and performance^{57,58}. Research has shown that skipping meals can lead to increases in perceived appetite and reduced satiety when one or two meals are missed and periods of restriction can result in binge-eating and other disordered eating behaviours among susceptible individuals⁵⁹⁻⁶¹. In contrast, reported boredom at work was positively associated with the consumption of eating foods high in sugar and fat⁵². Given that shift workers are typically more active than office workers, it is possible that office workers have fewer opportunities to compensate for ingestion of excess calories⁶². In summary, it is clear that some of the same broad factors appear to affect eating behaviours of office workers and nurses working in health care environment, although research with employees in sedentary roles identified some unique factors.

This review highlights paucity of existing literature. The focus on different aspects of eating behaviour varied between studies, which makes it particularly difficult to compare their results.

Some studies focused on lunch⁴², other on snacking^{22,39,40}, and yet others on eating patterns throughout the working day^{4,5,49,51}. Moreover, the current review highlighted heterogeneity in the methods used to measure eating behaviours. Among those used in studies considered in this review, authors relied on self-reports, observational methods, and canteen sales data to analyse purchases. The majority of studies used a variety of self-reported measures of eating behaviours^{40,49}. This is concerning as evidence suggests that self-reporting of food intake and body weight may be subject to underreporting^{63,64}. Alternative methods of capturing eating behaviours at work included observational methods³⁹ and analysis of canteen sales figures^{26,46}. However, both approaches increase difficulty of assessment of eating behaviour at an individual level^{26,39,46,50} and canteen sales do not measure actual consumption^{26,46}. Furthermore, in some studies, free food was available to employees^{22,26,39,41}, which makes both generalisability and comparison of the findings difficult. Evidently, there is a need to develop objective measures of eating in the workplace. Given that self-reports can lead to omission and recall bias, this could be overcome by collecting self-reported data in real time, by using experiential sampling methods, for example⁴⁰.

A large number of studies included in this review were cross-sectional and qualitative, which limits the ability to make claims about causal relations^{39,40}. There is an evident lack of high quality longitudinal research which could determine the long-term impact of the work environment on eating behaviours⁴⁷. Another potential issue is that most studies relied on willing volunteers and that a high proportion participants were female^{22,42,52-54}. Self-selected participants may be motivated to lose weight⁴², have a greater interest in their health and/or more time to participate⁶⁵ than those who do not respond to requests for participants, affecting the generalisability of study's results.

Many studies did not consider the broader food environment outside of the workplace (e.g. supermarkets, take away shops). This is important as the availability and proximity of unhealthy foods in nearby neighbourhoods may increase consumption of such foods during the working day.

Similarly, office design may influence eating behaviours, as one study found that visibility of food in an open floor plan increased the amount consumed⁶⁶. Given the growing number of open plan offices, it is unclear if this particular design choice influences eating behaviour of the workforce in a real-world setting.

This review is not without limitations. Many studies did not consider office-based workplaces and a white-collar population as unique features of their designs. Few studies used other populations/environments as a control, and it is therefore difficult to assess the extent to which reported results are in fact specific to the population of the office-based workers. Indeed, many studies were excluded from this review merely because they did not provide sufficient information about the workplace context in which the study was conducted.

In summary, the findings of this review highlight the need to understand factors affecting eating behaviours in the workplace in more depth. First, future research should continue to test modifications of the workplace food environment to encourage healthy food choices. Second, research should aim to develop a validated measure of eating behaviour at work. Third, more research is required to explore social influences on eating at work^{22,39,51,54}. In one recent and promising workplace intervention vegetable purchases increased after posters displaying a descriptive social norms message were introduced³². Such an intervention is relatively cheap and easy to implement, and yet it can leverage the power of social norms. More randomized controlled trials and longitudinal research should establish how to best use social norms to improve eating behaviours in the office-based workplaces. Fourth and finally, work demands may lead to restrictive eating patterns, therefore more research is required to investigate disordered eating at work and any predictors that can generate or exasperate disordered eating^{22,51,52}.

Conclusion

This review helps to further understanding on eating behaviours in an office-based workplace. Identifying factors that influence eating at work is a vital step towards a healthier and more productive workplace. The office workplace is a unique microenvironment where people spend most of their time and consume most of their calories. This review demonstrated several factors that can have a positive and negative impact on eating behaviours in office-based workplaces. Interventions based around social and physical aspects of the workplace appear to be most promising, but more research is needed to establish strong causal links.

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