Office cake culture: an exploration of its characteristics and associated behaviours and attitudes among UK office workers and implications for workplace health

Short title: Office cake culture: implications for workplace health

Abstract

Purpose:

This paper explores the characteristics of office cake (OC) consumption and the associated attitudes and behaviours among UK office workers to gain insight into the implications for workplace health.

Design:

A cross-sectional online questionnaire was completed by 940 respondents. Data were analysed using descriptive statistics and cross-tabulation with Chi-square tests for between-group difference.

Findings:

Respondents reported both positive social and negative health-related consequences of OC. OC influenced eating behaviour through increased salience and availability, and the effects of social influencing. Almost all (94.8%) reported ideal OC frequency to be once/week or less. Gender and age significantly affected attitudes and behaviour.

Research limitations/implications:

The questionnaire was not validated so data accuracy could have been diminished or biased. Portion size was not examined and consumption data was self-reported which could have resulted in under-reporting. Only office workers were investigated therefore results may not be applicable to other workplaces.

Practical implications:

OC appears to influence both the workplace eating environment and employee eating behaviour. It could therefore affect employee health and workplace health promotion programme efficacy. However the findings suggest that nudge-based initiatives could reduce OC consumption to make workplaces healthier while retaining social benefits.

Originality/value:

The present study provides the first data on OC culture and insights on how to address it sensitively. It also highlights that sweet treats used for celebration and employee recognition should be considered a relevant part of workplace food provision alongside canteens and vending.

Keywords: cake culture, obesity, workplace, environment, snacking, norms, health, nutrition

Introduction

Obesity prevalence continues to rise globally, as do associated co-morbidities and healthcare costs (N. C. D. Risk Factor Collaboration, 2016). Consequently obesity represents a major public health challenge (Public Health England, 2017). The workplace represents an important setting for the promotion of healthy lifestyle behaviours (Engbers et al., 2005; Black, 2008) and has been the focus of numerous studies examining health promotion.

Compared to interventions involving diet and/or physical activity, multicomponent workplace health promotion programmes (WHPPs) incorporating environment modification have the greatest effects improving dietary behaviour (Allan et al., 2017), diet quality (Engbers et al., 2005) and weight loss (Verweij et al., 2011). Environment modification can make environments less obesogenic **(Swinburn et al., 2011)** and therefore easier for individuals to make healthier lifestyle choices without conscious effort (Marteau et al., 2012; Salmon et **al., 2014**).

The social nature of offices would suggest that social influencing could affect workplace eating behaviour. Social influences affect the amount and types of food eaten (Herman et al., 2003; Robinson and Higgs, 2013; Cruwys et al., 2015) allowing people to feel they are behaving appropriately in a given group (Herman et al., 2003; Robinson et al., 2011; Cruwys et al., 2015). Interestingly, if available, sweet foods and cake appear to override salient social models and are chosen in preference to other available foods (Pliner and Mann, 2004). Similarly, when eating with friends, people eat significantly more cookies and cake than other available foods (Clendenen et al., 1994; Hetherington et al., 2006). The role of social norms on dietary behaviour has also been examined widely. Descriptive norms represent behaviour that is typical or normal ('what is done') while injunctive norms refer to behaviour considered morally-approved ('what ought to be done') (Deutsch and Gerard, 1955; Cialdini et al., 1990). Descriptive norms influence both healthy and unhealthy eating behaviour (Perkins et al., 2010; Lally et al., 2011; Cruwys et al., 2015) even without other people being present (Burger et al., 2010; Prinsen et al., 2013).

Combined as 'subjective norms', descriptive and injunctive norms form one of three constructs within The Theory of Planned Behaviour (TPB) (Ajzen, 1991; Ajzen, 2005) which holds that intention is the best predictor of behaviour. 'Attitude' is the product of beliefs about the consequences of performing or not performing a behaviour and the strength of those beliefs. 'Perceived behavioural control' (PBC) is a product of self-efficacy and perceived barriers to or facilitators of a behaviour. The more positive the combination of these constructs, the stronger the intention to perform a behaviour. The TPB is one of the most widely-tested health behaviour theories (Ajzen, 2011;

McEachan et al., 2011; Zoellner et al., 2012) and has been widely used to explore dietary behaviour (Kelley and Abraham, 2004; Palmeira et al., 2007; Chung and Fong, 2015).

Daily eating patterns may affect weight and health risk (Duffey and Popkin, 2011; Nicklas et al., 2014; Leech et al., 2015; Murakami and Livingstone, 2016b). Recent decades have seen increases in eating frequency (Popkin and Duffey, 2010; Kant and Graubard, 2015) and total energy intake from snacking (Ovaskainen et al., 2006; Piernas and Popkin, 2010; Kant and Graubard, 2015). Snacking is positively associated with energy intake (Duffey and Popkin, 2011; McCrory et al., 2011; Nicklas et al., 2014; Kant and Graubard, 2015) and added sugar consumption (Ovaskainen et al., 2006; Louie and Rangan, 2018) although not always with adiposity (Hampl et al., 2003; Nicklas et al., 2014). Snacking has been associated with improved diet quality through increased nutrient intake from fruit and vegetables (Holmback et al., 2010; Zizza et al., 2010; Zizza and Xu, 2012; Hartmann et al., 2013) but also diminished diet quality from increased energy density, and sugar and fat intake, (Hartmann et al., 2013; Murakami and Livingstone, 2016a). Cakes and similar sweet baked goods are the primary energy contributors to snack food (Ovaskainen et al., 2006; Duffey et al., 2013; Nicklas et al., 2014; Myhre et al., 2015) and are consumed equally by both healthy and unhealthy snackers (O'Connor et al., 2015). Furthermore, added sugars are associated with obesity (Scientific Advisory Committee on Nutrition, 2015) and ultra-processed foods such as commercially-produced cakes and snacks are associated with cancer (Fiolet et al., 2018) and all-cause mortality (Schnabel et al., 2019).

Workplace snacking has not been widely studied. One study found both unhealthy and healthy snacking were significantly more likely in the workplace than the home (Liu et al., 2015), and ~~three~~ studies have found that workplace snacks were more likely to be eaten if they were visible, accessible and convenient (**Painter et al., 2002; Baskin et al., 2016)**. One form of workplace snacking that has become prominent in recent years is the provision of cake and other sweet foods by employees and management for colleagues to share, so-called 'office cake' (OC). Anecdotally, OC consumption in the UK originated from employees providing cakes to celebrate social occasions. Recently it has expanded to include support for charity fundraising efforts, baking inspired by TV shows, employee rewards, and other morale-boosting events. It has been speculated that OC consumption leads to increased energy intake, particularly from added sugars, and obesity (Royal College of Surgeons, 2017). However, no data are available.

The present study explored the characteristics of OC consumption and associated attitudes and behaviours among UK office workers. Implications for workplace health were assessed. OC was defined as cakes or other sweet foods (biscuits, pastries, confectionery) provided by employees or managers to share with colleagues.

Method

Study design

A cross-sectional survey was conducted via a self-administered online questionnaire using Online Surveys (www.onlinesurveys.ac.uk).

Materials

The questionnaire was specifically-developed, mainly using items adapted from validated eating behaviour questionnaires (Stunkard and Messick, 1985; Clark et al., 1991; Fleurbaix Laventie Ville Sante Study Group, 2004; Schembre et al., 2009; Tapper and Pothos, 2010; Greenwood et al., 2012; Simmonds et al., 2016). Where possible, item wording and structure reflected that of validated questionnaires. For example, the Healthy Eating Vital Signs assessment tool validation found that asking about typical behaviour was more effective than asking about one-day or one-week recall, and that asking about 'frequency' was more effective than 'servings' (Greenwood et al., 2012). Several items were able to reflect validated questionnaire wording more directly. For example, the item "I find it hard to resist cake even if I'm not hungry or have just eaten a meal" closely reflects Item 1 of the Three-Factor Eating Questionnaire R-18: "When I smell a delicious food, I find it very difficult to keep from eating, even if I have just finished a meal" (Fleurbaix Laventie Ville Sante Study Group, 2004) and Item 13 of the Weight-Related Eating Questionnaire: "When I'm offered delicious food, it's hard to resist eating it even if I've just eaten" (Schembre et al., 2009). ~~although~~S ~~s~~ome items were developed in response to an informal qualitative enquiry on social media. Some of these items were used to explore OC behaviour and attitudes eg "I feel regret after eating OC" and "I look forward to OC"; and others to explore OC-related opinions~~.~~ e.g. "I would like my workplace to do more to help me be healthy" and "Do you think there is a healthier alternative to office cake?".

Items about OC behaviour and attitudes were based on the TPB to allow exploration of respondents' beliefs about the consequences of OC (attitude), their response to the behaviour and approval of colleagues (subjective norms) and their ability to control or mitigate their OC own consumption (PBC). Tables 3 and 4 indicate the corresponding TPB dimension for each item. Although the questionnaire was not designed or validated to confirm the TPB's role in OC consumption, the TPB provided a framework from which to explore OC behaviour. This approach has been used elsewhere (Tonglet et al., 2004). The questionnaire was developed using the TPB author's guidelines (Fishbein, 2010).

Following ethical approval, the questionnaire was piloted with a convenient sample (*n* 9).

The questionnaire was structured as follows:

Section 1: nine items explored existing OC culture in respondents' workplaces e.g. "In a typical working week, on how many occasions are cakes available in your office?" (multiple choice response); and "Typically in your office, where are office cakes displayed?" (multiple choice response).

Section 2: 20 items explored respondents' own OC behaviour e.g. "In a typical week, on how many occasions do you personally eat office cake?" (multiple choice response); 5-point Likert-style scale from Never to Always for items such as "If there is cake available, I eat it" and "It's hard to say no to cake if everyone else is eating it"; and 5-point Likert-style scale from Strongly Agree to Strongly Disagree for items such as "Office cake has made it harder to control my weight" and "Office cake has made it harder for me to eat healthily at work".

Section 3: nine items explored respondents' opinions of OC culture in general e.g. "In your opinion, what is the ideal frequency for office cakes?" (multiple choice response); and 5-point Likert-style scale from Strongly Agree to Strongly Disagree for items such as "Overall, office cake is a good thing" and "Office cake brings people together".

Section 4: six demographic items requested gender, age group (AG), job role, working pattern and self-reported height (m) and weight (kg) from which body mass index (BMI) was calculated.

The questionnaire was voluntary, anonymous and confidential to encourage response.

Sampling

Two sampling strategies were used to recruit office workers aged ≥18 years. Four demographically-diverse organisations were recruited before the survey opened, giving potential access to approximately 3500 participants through cluster sampling (Table 1). Organisations agreed to distribute questionnaires internally by email to minimise coverage and sampling error. Snowball sampling was conducted through the first author's social media and email contacts. Invitations to participate were objective and neutral to minimise non-response bias. Participants confirmed eligibility and consent by questionnaire submission. In accordance with ethics committee requirements, snowball sample participants confirmed they worked in England.

Data collection

Data collection for both strategies occurred between 1st and 31st May 2017. Participants completed identical questionnaires, although each participating organisation had a unique identifier to enable between-company comparisons.

Statistical analysis

Descriptive statistics and cross-tabulations were used to analyse demographic data. Chi-square tests were used to test for between-group difference. Kruskal Wallis ANOVA were used to test for BMI difference between demographic groups with Mann Whitney-U post hoc tests and Bonferroni adjustment. The significance level was set at $p<0.05$.

After initial data exploration revealed significant differences for AG and gender, variables for Likert-type scale items were recoded and condensed to further investigate trends in demographic difference. 'Strongly agree' and 'agree' were condensed to 'strongly agree/agree'; 'disagree' and 'strongly disagree' to 'disagree/strongly disagree'; 'sometimes' and 'about half the time' to 'sometimes/half the time'; and 'often' and 'always' to 'often/always'. Responses to weekly OC refusals 'once/day' and 'several times/day' were also condensed. A similar approach has been taken in eating behaviour research (Ball et al., 2010; Hartmann et al., 2013) including workplace studies (Tabak et al., 2015; Watts et al., 2016).

Data were analysed using the statistical software package IBM SPSS Statistics for Windows version 23.

Results

Across both sampling strategies, 940 respondents completed the questionnaire. Missing data was 0.4% for gender and 0.5% for AG. Percentages presented were calculated excluding missing data.

Participant characteristics

Organisation D withdrew because the relevant internal permissions had not been given, although three people responded independently. Data from both sampling strategies were therefore combined to form a single sample of 940 respondents.

Table 2 summarises respondents' demographic characteristics. Means are presented ± one standard deviation. Of the total sample, 39.3% were male. The mode AG was 30-49 years (30-49s) (55.6%) and 81.0% worked full-time. Mean BMI was 25.9 ± 5.24kg/m^2 and was significantly ($p<0.001$) higher in men (26.1 ± 4.4 kg/m^2, [95% Confidence Interval (CI) 25.6, 26.5]) than women (25.7 ±5.7 kg/m^2, [95% CI 25.3, 26.2]). Mean BMI for the 18-29 AG (18-29s) (24.3 ± 4.3 kg/m^2 [95% CI 23.6, 24.9]) was significantly ($p<0.001$ for all) lower than for both 30-49s (26.2 ± 5.5 kg/m^2 [95% CI 25.7, 26.7]) and ≥50 AG (≥50s) (26.3 ±5.1 kg/m^2 [95% CI 25.6, 26.9]). Kruskal Wallis ANOVA found no significant difference in BMI according to either OC availability or OC consumption frequency.

Characteristics of office cake culture

For weekly OC availability and consumption, results are reported for full-time workers (FTWs) only. OC was typically available at least once-twice/week for 87.0% of respondents. The mode availability was once-twice/week for 65.8%, with 7.9% reporting daily availability. There was no effect of gender or AG. 'Hardly any' OC was homemade according to 51.0%. The most commonly-given reasons for OC were birthdays/retirements/promotions (93.5%), meeting/event leftovers (55.0%), TV/charity events (49.4%) and management rewards (37.8%), while 41.5% said no reason was needed. The mode location for OC display was the main working area (70.9%). The most commonly-offered OC alternative was fruit (46.9%), although 37.3% said no alternatives were ever available.

Half (50.5%) the respondents strongly disagreed and disagreed that meeting refreshments provided sufficient healthy options, with significantly more ≥50s (15.6%) strongly disagreeing than 18-29s (7.6%).

Respondents' own OC behaviour and attitudes

The mode frequency of typical personal weekly OC consumption (57.8% of respondents) was once-twice/week. The mode number of refusals of OC (46.6%) was 1-3 times/week with 12.6% refusing several times/day. The condensed analysis found significantly more women (22.0%) than men (13.6%) refused at least once/day.

Responses to Likert-type scale items are summarised in Tables 3 and 4.

For attitude-related items, gender had an effect with significantly more women than men acknowledging negative consequences of OC. There were significant trends for fewer women than men, and fewer ≥50s than 18-29s to look forward to OC, and for more women than men to feel regret after eating it.

Subjective norm-related responses were mixed according to the type of norm and were influenced by AG and gender. Figure 1 shows the mode referent group was 'other'. Analysis of respondents' qualitative description of 'other' found that all but 11 of the 350 respondents selecting this option (36.1% of the total sample) defined 'other' as 'myself', 'me', 'no one else' or similar. Significantly fewer 18-29s responded other/'self' than older AGs, instead citing work colleagues and family/friends as key referents.

OC behaviour was not substantially affected by injunctive norms with the majority of respondents reportedly unaffected by colleagues' approval or disapproval of either OC or their (respondents') own OC behaviour. However, items with a descriptive norm component influenced behaviour for the total sample with significant differences for gender and AG. Significantly more women and younger respondents were persuaded by colleagues to change their minds about initially refusing OC

and struggled to refuse OC if others were eating it. The condensed analysis consolidated these findings.

PBC-related responses suggested that OC challenges respondents' self-efficacy, but to differing extents according to gender and AG. If OC is available, over 90% reported eating it at least sometimes and 41.5% often or always. Significantly more of these were men than women (48.9% and 36.6% respectively in the condensed analysis). The condensed analysis also found significantly more 18-29s than ≥50s reported eating OC often/always if it was available (52.3% and 35.4% respectively). Significantly more women than men found it hard to resist OC even if they were not hungry or had just eaten a meal, and to be distracted by it. Most respondents reported being less likely to eat OC if it was out of view with the condensed analysis finding significantly more women (61.8%) than men (52.4%) responded 'often/always'.

More than half (54.4%) the respondents said they never took action to avoid or compensate for OC consumption. Of these, significantly more were men and ≥50s than women and 18-29s. Significantly more women (34.9%) than men (23.9%) said they avoided or compensated for OC consumption once-twice/week and significantly more 18-29s than ≥50s did so three-four times/week. Increased exercise and reduced energy intake at other meals were typical examples of compensatory activities.

Participants' opinions about OC

Most respondents strongly agreed and agreed that OC 'is a good thing', 'is a great way to show appreciation', 'brings people together' and 'cheers everyone up' with significantly more 18-29s and men strongly agreeing. Table 5 shows that nearly all (94.8%) respondents said the ideal OC frequency was once/week or less. The mode ideal frequency was once/month. There was a significant trend for women to consider the ideal frequency to be lower than men.

The condensed analysis found significantly more women than men strongly agreed/agreed (38.9% and 31.5%% respectively) they would support initiatives to reduce OC consumption. Over half of respondents strongly agreed or agreed they would like their workplace to do more to promote health, with the condensed analysis revealing significant trends for more women and younger AGs to strongly agree/agree.

The most popular alternative to OC was fruit (51.5%), followed by 'cake less often' (47.9%), nuts (33.0%) and raw vegetables and dips (33.0%).

Between-organisation comparisons

Between-organisation comparisons showed that the demographic profile of each organisation affected responses in line with findings from the total sample.

Discussion

To our knowledge, the present study provides the first data on UK OC culture, describing its main characteristics and office workers' OC-related behaviour and attitudes. Two thirds of FTWs typically ate OC at least once/week and in most workplaces OC was available up to five times/week. Most OC is shop-bought, available most commonly to celebrate social occasions, and displayed in the main office area. OC was generally considered to have morale-boosting characteristics as well as negative consequences such as facilitating weight gain. Almost all respondents said ideal OC frequency was once/week or less but only a third agreed they would welcome a workplace initiative to achieve that. An important finding was that for most items exploring OC behaviour and opinions, gender had a significant effect, with age significantly effecting some items. Apart from Organisation C having higher availability and consumption frequency, there were no between-organisation differences, suggesting OC impacts diverse office environments in similar ways.

That OC was widely available aligns with evidence that an increasing proportion of daily energy intake is from snacks (Kant and Graubard, 2015), cake and sweet baked goods are the primary energy-contributors to snack foods (Duffey et al., 2013; Myhre et al., 2015) and snacking is more likely in the workplace than at home (Liu et al., 2015).

The effects of gender have implications for employers and WHPPs. It is well-established that gender differences exist in food choice and behaviour (Rolls et al., 1991; Wardle et al., 2004; Li et al., 2012; Cruwys et al., 2015). The present study found more women than men acknowledged OC's negative consequences. This is consistent with evidence that women are more likely to avoid energy-dense foods, eat fruit and vegetables, diet to lose weight and value healthy eating (Rolls et al., 1991; Fagerli and Wandel, 1999; Wardle et al., 2004). Meanwhile, more men said they never refused OC and did not acknowledge negative consequences. This aligns with evidence that men have poorer diet quality (Wardle et al., 2004), food knowledge (Baker and Wardle, 2003) and less regard for healthy eating behaviours and guidelines (Wardle et al., 2004).

Findings on the effects of social influencing and subjective norms support previous research. While nearly a third of respondents reported that work colleagues were their OC referents, more reported they had no referent other than themselves. This may partially explain why respondents were not influenced substantially by injunctive norms because injunctive norms relate to the approval of others. Nevertheless, social modelling has been shown to influence eating behaviour (Herman et al., 2003; Vartanian et al., 2015), especially in the workplace (Quist et al., 2014) and among socially-connected people (Christakis and Fowler, 2007; Pachucki et al., 2011). Therefore, self-referents could have been demonstrating the third-person effect whereby individuals deny being affected by

social modelling (Davison, 1983). This has been reported in eating behaviour (Vartanian et al., 2008; Croker et al., 2009). Because modelling is partly automatic (Cruwys et al., 2015) these individuals could be more influenced by social influences than they realise.

The lack of injunctive norm effect also aligns with evidence that injunctive norms are less effective than descriptive norms in influencing eating behaviour (Stok et al., 2014; Cruwys et al., 2015). Responses to the items with a descriptive norm component suggest OC consumption could be influenced by descriptive norms, particularly among women and younger people. In particular, the present study might help raise employers' awareness of how different types of norm-related communication affect health behaviours (Croker et al., 2009; Stok et al., 2015). Information-based messages typically rely on injunctive norms (eg 'eat salad for lunch') which are less effective than messages based on descriptive norms (eg 'salad is one of our most popular dishes') (Rivis and Sheeran, 2003; Croker et al., 2009; Mollen et al., 2013; Higgs and Thomas, 2016). One such message provided by the present study's findings would be: '95% of office workers think the ideal frequency for cake is once/week or less'. In the absence of adequate healthy descriptive norm information, highlighting healthy intentions could be an effective way to promote healthy behaviour eg 'most employees are committed to eating healthily' (Croker et al., 2009).

PBC-related data indicated OC was generally hard to resist, with women struggling more than men. These results support research using other behavioural models that found women have significantly greater eating-related self-determined motivation than men (Ryan and Deci, 2000; Leblanc et al., 2015) and higher dietary restraint (Stunkard and Messick, 1985; Provencher et al., 2003). Women also generally show higher diet-related disinhibition levels than men (Stunkard and Messick, 1985; Provencher et al., 2003) which could explain why more women than men reported being distracted by OC and found it hard to resist even if they were not hungry.

No gender difference was found in OC consumption frequency. This was unexpected because, compared to men, women have a higher number of daily eating occasions (Kant and Graubard, 2015) and higher snacking frequency (Hartmann et al., 2013; O'Connor et al., 2015).

The present study presents a picture of men being more able to take OC or leave it without anxiety, guilt or concern for the consequences, whereas women appear more likely to be aware of OC and less able to resist it, despite being cognisant of negative health consequences. This could make OC a difficult topic to discuss in the workplace. Employers should consider how a workplace's gender profile could affect initiatives to address OC consumption and other dietary-related initiatives. The effects of gender on workplace eating and snacking should be explored further.

The effect of age

AG affected some responses, particularly those investigating OC's morale-boosting attributes and PBC. More 18-29s than ≥50s ate OC if it was available and acknowledged its morale-boosting characteristics. 18-29s can be broadly classified as Generation Y (GenerationY.com, 2015), the generation most likely to snack, with 24% considered 'super snackers' who snack four or more times/day (Topper, 2015). Generation Y are accustomed to frequent snacking whereas older people may tend to regard snacks as an occasional treat, potentially explaining why snacking frequency declines with age (Topper, 2015). This could also explain why fewer ≥50s than 18-29s considered OC a good way to show appreciation and has implications for employee performance management and motivation.

Data on how age effects eating behaviour are scarce but the present study's findings are consistent with studies using the Three-Factor Eating Questionnaire (Stunkard and Messick, 1985) which found restraint scores increased and disinhibition and hunger scores decreased with age (Drapeau et al., 2003; Harden et al., 2009; Löffler et al., 2015). The present study shows the behaviour and attitudes towards OC of younger employees differ to those of older employees, possibly mediated by social influencing, descriptive norms and generational effects. Further research would help establish whether age effects could inform dietary behaviour interventions within and outside the workplace.

The effect of the environment on OC consumption

The present study demonstrates several ways in which the presence of OC appears to influence eating behaviour, supporting previous research findings that the physical food environment affects dietary behaviour (Graham et al., 2013), including in the workplace (Kleef et al., 2012; Velema et al., 2018). First, OC was mostly displayed openly in the working area and almost all respondents said if it is available they eat it at least sometimes. This suggests an OC display prompts consumption which is consistent with evidence that the thought, sight or smell of palatable food stimulates hunger and motivation to eat (Ferriday and Brunstrom, 2011; Ramaekers et al., 2014). Additionally, nearly all respondents said they thought they were less likely to eat OC if it is out of view, which is consistent with evidence that consumption decreases as food becomes more inaccessible (Meiselman et al., 1994; Scott et al., 2011; Maas et al., 2012) including in the workplace (**Painter et al., 2002**). Furthermore, habitual disinhibition is a strong behavioural correlate with weight gain in older women (Hays and Roberts, 2008) therefore a regular OC display could create conditions in which individuals, particularly women, habitually respond by eating available OC. Lastly, an environment where OC consumption increases could lead to formation of new social norms and social modelling which encourages OC consumption (Cruwys et al., 2015).

'Choice architecture', or 'nudging' techniques express desired behaviours as descriptive norms without choice being removed or forced in any direction (Thaler R. & Sunstein, 2009). Nudging has improved eating behaviours (**Mela, 2006; Thaler R. & Sunstein, 2009; Bucher et al., 2016)**, including in the workplace (Thorsen et al., 2010; Kleef et al., 2012; Velema et al., 2018), and has reduced energy intake without individuals realising or feeling dissatisfied (**Petrescu et al., 2016)**. Nudging could therefore be acceptable to employees as a way to reduce OC consumption.

Over half the respondents reported OC made it harder to eat healthily at work. The present study found no association between BMI and either OC availability or consumption frequency although it was not designed to do so. Nonetheless, almost a third of respondents reported OC had contributed to weight gain, so research to investigate relationships between OC, obesity and its comorbidities would be worthwhile.

Ideal OC frequency

Of interest is the discrepancy between almost unanimous support for an ideal OC frequency of once/week or less, and the relative lack of support for interventions to achieve lower OC consumption levels. Gender could be a factor: significantly more women than men said they would support an initiative to reduce OC and would welcome more WHPP. Another factor could relate to commensality, defined as people eating and drinking together at the same time (Kerner, 2015). Commensality has been associated with improved cooperation and performance among workgroups (Kniffin et al., 2015), cooperation and trust (Allen-Arave et al., 2008; Mameli, 2013) and connection between eating companions (**Alley, 2012**). Morale-boosting consequences of OC reported by respondents could result from their subliminal recognition of the benefits of commensality. It is therefore possible that respondents assumed OC reduction would mean reduction in opportunities to socialise. A contrasting proposal is that reducing OC frequency could enhance commensality benefits by making OC a treat to look forward to with people gathering together. This could be considered more socially beneficial than the current prevalent situation where cake is displayed openly all day for people to help themselves to, with no group social interaction at all. It would be useful to investigate this and explore which elements of OC culture people value most - the cake itself, social interaction or having a break from work for example.

The question arises that if 95% of respondents considered once/week or less to be the ideal OC frequency and the second most popular OC alternative was 'cake less often', why is availability high? Social influences affect the amount and type of foods eaten (Herman et al., 2003; Cruwys et al., 2015) and social modelling occurs because individuals seek social cues that indicate appropriate behaviour (Herman et al., 2003; Robinson, 2015) and ways to affiliate and ingratiate (Hermans et al.,

2009; Robinson et al., 2011; Cruwys et al., 2015). In a workplace setting, this would suggest that individuals wanting to achieve workgroup acceptance are more likely to comply with established OC culture norms than risk alienation by refusing it or challenging it. The present study provides an evidence-based method to counteract this. As previously suggested, a descriptive norm-based message that 95% of office workers consider the ideal frequency for OC to be once a week or less could nudge employees towards new norms, healthier eating behaviours and healthier workplaces.

Relatedly, social influencing and modelling theories contribute to some descriptions of social contagion theory (Marsden, 1998). Social contagion may be responsible for the spread of positive and negative health-related behaviours including smoking (Christakis and Fowler, 2008), happiness (Fowler and Christakis, 2008) and obesity (Christakis and Fowler, 2007) so it is reasonable to propose that it may provide a mechanism for increasing OC availability and consumption. Additionally, as in the present study, social contagion has been shown to be affected by gender (Christakis and Fowler, 2007). Furthermore, social contagion may affect work colleagues differently to friends (Christakis and Fowler, 2008; Fowler and Christakis, 2008). Future research to explore workplace eating through the lens of social contagion theory would be useful.

The present study demonstrates that when considering the health of the workplace eating environment, food provision by employers - canteens, vending etc - should not be considered in isolation. Food supplied by employees, managers and clients should also be taken into account as part of that workplace's food environment. Furthermore, by impacting employee eating behaviour, OC could undermine WHPP effectiveness, reducing return on workplace health investment.

Recommendations

Recommendations for employers can be drawn from the present study's findings. Making changes to the workplace environment to reduce the salience of OC and create new social norms would help employees make healthier food choices without effort. Initiatives to gain acceptance that OC access be restricted to time-limited occasions, and keeping OC out of sight until those occasions, would prevent mindless OC consumption and distraction. Encouraging healthier OC alternatives extends choice and commensal inclusivity. Starting a conversation that leads to fewer OC occasions, informed by descriptive norm-based messages, would provide commensality benefits from social occasions that employees can to look forward to. Recognising that a workplace's gender and AG profile creates differences in OC-related attitudes may improve chances of effective change.

Communicating with health-related messages based on descriptive norms rather than injunctive norms is more likely to change dietary behaviour.

Strengths/limitations

The present study has some strengths. It supplies the first data on the well-recognised but poorly-understood OC phenomenon and contributes to the literature on the effects of gender and age on social influences on eating behaviour. The sampled population was large enough to provide significant results and, unlike many studies investigating obesity and dietary behaviour, 39.3% of the participants were male which improved the representative quality of the sample and adds to the literature on male eating behaviour. It also provides insights into constructive ways to improve employee health and therefore public health through achievable adjustments to workplace culture and environments.

There were limitations. The questionnaire was non-validated so data accuracy could have been diminished. Relatedly, some items were not optimally operationalised which could have led to measurement and response bias. Insufficient items were included to explore the effect of descriptive norms. Portion size was not examined and consumption data was self-reported which could have resulted in under-reporting. The social media-based recruitment strategy could have been subject to response bias. Differences in comparator group size could have skewed between-AG comparisons. Only office workers were investigated therefore results may not be applicable to other workplace environments such as factories, hospitals or retail. Similar studies in other workplace environments are warranted.

Conclusion

In UK offices, OC appears to influence the physical workplace environment and dietary behaviour through increased salience and availability, and social influencing effects. OC behaviour and attitudes vary widely and are significantly affected by gender and age, therefore WHPP design should reflect salient gender and age profiles. There is consensus on ideal OC frequency which suggests nudge techniques to reduce salience and frequency of OC and reduce OC consumption could make workplaces healthier while retaining commensality benefits.

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Tables

Table 1: Descriptions of organisations recruited for the cluster sample

Organisation	Description	Location	Employee description
A	Engineering and innovation function of an international manufacturer. Approximately 800 staff	The Midlands	Predominantly educated to at least graduate level. Professional plus admin staff
B	UK office of international operator in transport and infrastructure solutions. Approximately 1000 staff	Southern England	Predominantly educated to at least graduate level. Professional plus admin staff
C	Health-based charity. Approximately 250 staff	Mainly London, plus smaller offices around the UK	Mix of education level. Professional plus admin staff.
D	Group of three local authorities. Up to 1500 staff.	Home counties	Mix of education level. Professional plus admin staff

Table 2: Demographic characteristics of survey respondents

	Cluster sampling				Snowball sampling	Total sample
	Organisation A n (%)	**Organisation B n (%)**	**Organisation C n (%)**	**Organisation D n (%)**	**n (%)**	**n (%)**
Number of respondents	173 (18.4)	107 (11.4%)	38 (4.0)	3 (0.03)	619 (65.9)	940 (100)
Gender						
Male	126 (73.3)	61 (57.5)	6 (15.8)	0 (0)	175 (28.3)	368 (39.3)
Female	46 (26.7)	45 (42.4)	32 (84.2)	3 (100)	442 (71.6)	568 (60.7)
Total	172 (100)	106 (100)	38 (100)	3 (100)	617 (100)	936 (100)
Missing	1	1	-	-	2	4
Age group						
18-29 years	57 (33.1)	17 (15.9)	6 (15.8)	0	92 (15.0)	172 (18.4)
30-49 years	83 (48.3)	54 (50.5)	23 (60.5)	1 (33.3)	359 (58.4)	520 (55.6)
≥50 years	32 (18.6)	36 (33.6)	9 (23.7)	2 (66.7)	164 (26.7)	243 (26.0)
Total	172 (100)	107 (100)	38 (100)	3 (100)	615 (100)	935 (100)
Missing	1	-	-	-	4	5
Pro-rata work time						
Full time	170 (98.3)	100 (93.5)	32 (84.2)	2 (66.7)	457 (73.8)	761 (81.0)
80%	2 (1.2)	4 (3.7)	2 (5.3)	1 (33.3)	78 (12.6)	87 (9.3)
60%	1 (0.6)	3 (2.8)	3 (7.9)	0	53 (8.6)	60 (6.4)
50%	0	0	0	0	18 (2.9)	18 (1.9)
≤40%	0	0	1 (2.6)	0	13 (2.1)	14 (1.5)
Total	173 (100)	107 (100)	38 (100)	3 (100)	619 (100)	940 (100)
Missing	-	-	-	-	-	-
Mean BMI (kg/m²)	26.0	26.5	24.5	-	-	25.9

Table 3: Responses from questionnaire Likert-type scale items 'Never' to 'Always'

Item (TPB construct explored)	Demographic group	Never n (%)	Sometimes n (%)	About half the time n (%)	Often n (%)	Always n (%)
If OC is available, I eat it (PCB)	Total Men/Women 18-29/30-49/≥50	76 (8.1)	369 (39.3) (33.7/42.8)[a] (29.7/38.5/47.7)[b]	105 (11.2) (8.4/13.0)[a]	256 (27.2) (32.6/27.9/21.8)[b]	134 (14.3) (21.2/9.9)[a]
I find it easy to refuse OC (PBC)	Total Men/Women 18-29/30-49/≥50	115 (12.2)	230 (24.45)	119 (12.7)	225 (23.9)	251 (26.7)
I get distracted by the thought, smell or sight of OC (PBC)	Total Men/Women 18-29/30-49/≥50	360 (38.3) (44.6/34.0)[a]	305 (32.4)	65 (6.9) (4.9/8.3)[a]	151 (16.1)	59 (6.3)
If I refuse OC, colleagues persuade me to change my mind (Inj + Desc)	Total Men/Women 18-29/30-49/≥50	453 (48.2) (57.3/42.1)[a] (40.1/45.4/60.1)[b]	320 (34.0) (26.6/39.1)[a] (32.0/38.3/27.2)[b]	59 (6.3) (11.6/5.2/4.9)[b]	887 (9.3)	21 (2.2)
I feel regret after eating OC (Att)	Total Men/Women 18-29/30-49/≥50	356 (37.9)	311 (33.1)	65 (6.9)	134 (14.3)	74 (7.9)
I feel I cause offense if I refuse OC (Inj)	Total Men/Women 18-29/30-49/≥50	572 (60.9)	217 (23.1) (22.1/20.4/29.2)[b]	41 (4.4)	91 (9.7)	19 (2.0)
It's hard to say no if everyone else is eating OC (Desc)	Total Men/Women 18-29/30-49/≥50	395 (42.0) (51.1/35.9)[a] (36.6/39.8/50.6)[b]	256 (27.2) (22.6/30.5)[a]	75 (8.0)	151 (16.1) (22.1/16.3/10.7)[b]	63 (6.7)
I feel hurt if OC I've brought to share is refused (Inj)	Total Men/Women 18-29/30-49/≥50	676 (71.9) (77.7/68.1)[a] (62.2/73.7/75.3)[b]	139 (14.8) (22.1/12.7/14.0)[b]	41 (4.4) (4.7/5.4/1.6)[b]	62 (6.6) (3.8/8.5)[a]	22 (2.3)
I am made to feel uncomfortable if I refuse OC (Inj)	Total Men/Women 18-29/30-49/≥50	736 (78.3)	125 (13.3)	44 (4.7)	28 (3.0)	7 (0.7)
I find it hard to resist OC even if not hungry/have just eaten (PBC)	Total Men/Women 18-29/30-49/≥50	303 (32.2) (37.5/28.7)[a]	286 (30.4) (23.3/30.4/36.2)[b]	85 (9.0) (17.4/8.8/3.7)[b]	168 (17.9)	98 (10.4)
If OC is out of view I am less likely to eat some (PBC)	Total Men/Women 18-29/30-49/≥50	157 (16.7) (21.7/13.2)[a]	142 (15.1)	95 (10.1)	284 (30.2)	262 (27.9)
I look forward to OC (Att)	Total Men/Women 18-29/30-49/≥50	191 (20.3) (23.4/18.0)[a] (12.8/17.3/31.7)[b]	290 (30.9) (26.1/34.2)[a] (22.7/31.2/36.6)[b]	140 (14.9)	177 (18.8) (26.7/19.2/12.3)[b]	142 (15.1) (22.1/16.0/8.2)[b]

TPB, Theory of Planned Behaviour; OC, office cake; Att, attitude; Inj; injunctive norm; Desc; descriptive norm; PBC, perceived behavioural control

[a]: values differ significantly between genders at $p<0.05$

[b]: values differ significantly between age groups at $p<0.05$

Table 4: Responses from questionnaire Likert-type scale items 'Strongly agree' to 'Strongly disagree'

Item (TPB construct explored)	Demographic groups	Strongly agree n (%)	Agree n (%)	Undecided n (%)	Disagree n (%)	Strongly disagree n (%)
OC has contributed to increase in my weight (Att)	Total Men/women 18-29/30-49/≥50	73 (7.8) (5.4/9.3)[a]	221 (23.6) (17.9/27.3)[a] (21.5/27.1/17.3)[b]	174 (18.6)	257 (27.5)	211 (22.5) (28.8/18.5)[a] (20.3/19.8/30.0)[b]
OC has made it harder for me to control my weight (Att)	Total Men/women 18-29/30-49/≥50	64 (6.8) (4.3/8.5)[a]	268 (28.6) (24.2/31.5)[a]	122 (13.0)	271 (29.0)	211 (22.5) (30.7/17.3)[a] (22.7/19.6/28.8)[b]
OC makes a weight loss diet harder to stick to (Att)	Total Men/women 18-29/30-49/≥50	142 (15.1)	409 (43.5) (36.7/47.9)[a]	103 (11.0) (14.1/8.8)[a]	154 (16.4)	132 (14.0) (17.9/11.4)[a]
OC has made it harder for me to eat healthily (Att)	Total Men/women 18-29/30-49/≥50	89 (9.5) (7.1/11.1)[a]	264 (28.1)	136 (14.5)	270 (28.7)	181 (19.3) (25.8/15.0)[a] (16.9/16.5/26.7)[b]
OC is a good thing	Total Men/women 18-29/30-49/≥50	121 (12.9) (17.9/9.7)[a] (19.2/12.1/10.3)[b]	448 (47.7)	208 (22.1)	115 (12.2)	48 (5.1) (1.7/4.6/8.2)[b]
OC is great way to show appreciation	Total Men/women 18-29/30-49/≥50	109 (11.6) (15.5/9.2)[a] (17.4/11.5/7.8)[b]	519 (55.2) (64.5/53.8/51.9)[b]	143 (15.2) (9.3/16.0/17.7)[b]	135 (14.4) (6.4/15.6/17.3)[b]	34 (3.6)
OC brings people together	Total Men/women 18-29/30-49/≥50	161 (17.1) (24.4/17.3/11.5)[b]	596 (63.4)	79 (8.4)	82 (8.7) (3.5/9.6/10.7)[b]	22 (2.3)
OC cheers everyone up	Total Men/women 18-29/30-49/≥50	178 (18.9) (23.1/16.2)[a] (29.7/18.5/11.9)[b]	598 (63.6) (57.9/67.6)[a]	96 (10.2)	53 (5.6)	15 (1.6) (1.2/0.8/3.3)[b]
I would support an initiative to reduce OC consumption	Total Men/women 18-29/30-49/≥50	104 (11.1)	235 (25.0) (20.1/28.2)[a]	278 (29.6)	238 (25.3) (29.1/23.1)[a]	85 (9.0) (12.2/6.9)[a]
I would like my work-place to do more to help my health	Total Men/women 18-29/30-49/≥50	172 (18.3)	317 (33.7) (29.6/36.4)[a]	196 (20.9)	195 (20.7) (16.3/19.8/26.3)[b]	60 (6.4) (8.4/5.1)[a]

TPB, Theory of Planned Behaviour; OC, office cake; Att, attitude; Inj; injunctive norm; Desc; descriptive norm; PBC, perceived behavioural control

[a]: values differ significantly between genders at $p<0.05$

[b]: values differ significantly between age groups at $p<0.05$

Table 5: Ideal office cake frequency

	Never n (%)	Once per month n (%)	Once per fortnight n (%)	Once per week n (%)	Twice per week n (%)	Daily n (%)	Total n (%)
Gender							
Male	28 (7.6)[a]	120 (32.6)[a]	90 (24.5)[a]	104 (28.3)[a]	14 (3.8)[a]	12 (3.3)[a]	368 (100)
Female	29 (5.1)[a]	267 (47.0)[b]	129 (22.7)[a]	120 (21.1)[b]	17 (3.0)[a]	6 (1.1)[b]	568 (100)
Total	57 (6.1)	387 (41.3)	219 (23.4)	224 (23.9)	31 (3.3)	18 (1.9)	936 (100)
Age group							
18-29 years	5 (2.9)[c]	52 (30.2)[c]	53 (30.8)[c]	48 (27.9)[c]	10 (5.8)[c]	4 (2.3)[c]	172 (100)
30-49 years	22 (4.2)[c]	233 (44.8)[d]	121 (23.3)[c, d]	120 (23.1)[c]	14 (2.7)[c]	10 (1.9)[c]	520 (100)
≥50 years	29 (11.9)[d]	102 (42.0)[d]	45 (18.5)[d]	56 (23.0)[c]	7 (2.9)[c]	4 (1.6)[c]	243 (100)
Total	56 (6.0)	387 (41.4)	219 (23.4)	224 (24.0)	31 (3.3)	18 (1.9)	935 (100)

a, b: Values with different superscript letters differ significantly between genders at $p<0.05$

c, d: Values with different superscript letters differ significantly between age groups at $p<0.05$

Figure Legend

Figure 1: Respondents' most influential referent according to age group (■, total sample [*n* 935]; □, 18-29s [*n* 172]; ▣, 30-49s [*n* 520]; ■, ≥50s [*n* 243]). a, b: values with different superscript letters differ significantly at $p \leq 0.05$.