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Adherence to the Mediterranean diet among employees in South West England: Formative research to inform a web-based, work-place nutrition intervention

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ABSTRACT

Objective. The aim of this study is to assess internet usage patterns and adherence to the Mediterranean diet among employees in South West England, UK and their differences by personal characteristics.

Method. A cross-sectional survey was conducted in 2014 among 590 adults (428 women, 162 men, mean age 43.8 years), employees of four work-place settings. Mediterranean diet adherence was assessed using a validated food frequency questionnaire. Adherence differences were assessed by gender, marital status, education, number of children and food shopping and preparation responsibility.

Results. On average, participants reported moderate adherence to the Mediterranean diet. Higher adherence was reported for alcohol, vegetables, cereals and fruit. Few participants achieved high adherence to the Mediterranean diet recommendations for legumes (5.3%), fish (3.2%), dairy products (4.8%), red meat (11.9%), poultry (11.1%) and olive oil (18.2%). A higher Mediterranean diet score was reported among participants who were married/cohabiting, those with higher education attainment and shared responsibility for food preparation.

Conclusion. Improvement in the consumption of several Mediterranean diet components is needed to increase adherence in this sample of adults. The findings have the potential to inform the development of a web-based intervention that will focus on these foods to promote the Mediterranean diet in work-place settings in South West England.

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Introduction

The importance of studying and promoting dietary patterns, instead of isolated foods or nutrients, in order to increase the likelihood of acceptability and compliance with nutrition interventions, has been established (Hu, 2002). The Mediterranean diet, rich in olive oil, fruits and vegetables, including whole grains, legumes and nuts, low-fat dairy, fish, moderate alcohol consumption and low quantities of red meat, has been associated with a reduced risk of chronic disease incidence and mortality in the general population (Sofi et al., 2014). This dietary pattern has been recognised as a model for healthy eating and the need to promote it to non-Mediterranean populations has recently been recognised (Council of the European Union, 2014; National Institute for Health and Care Excellence, 2014). It has been suggested that its high palatability makes the Mediterranean diet an attractive diet to promote to Western populations (McManus et al., 2001; Willett, 2006). Components of this diet could be easily transferable to non-Mediterranean populations (Renaud et al., 1995; McManus et al., 2001) and therefore represent an opportunity to change dietary behaviours.

The need to design nutrition behaviour change interventions based on formative research has been emphasised (Kok et al., 2004; National Institute for Health and Clinical Excellence, 2007; Craig et al., 2008; World Health Organisation, 2009). The conceptualisation and development of such interventions should include the identification of the evidence and theory base, supplemented by a needs assessment phase, where health problems in the target population are identified and behavioural risk factors for these problems are assessed (Kok et al., 2004; Craig et al., 2008). Identifying the evidence, as well as the specific needs of the target population is suggested to aid the development and delivery of feasible and effective approaches to promote dietary behaviour change (National Institute for Health and Clinical Excellence, 2007; Craig et al., 2008).

The internet is widely accessible to the general public and is one of the most preferred sources of nutrition information (Horgan and Sweeney, 2012). In the first quarter of 2014, 87% of adults in the UK had used the internet, supporting its potential as a cost-effective intervention tool with large reach (Office for National Statistics, 2014a). Work-place settings provide mechanisms to promote dietary behaviour
change since they offer accessibility to large populations of adults who can be surveyed repeatedly (Maes et al., 2011). Several web-based nutrition intervention studies have been conducted in work-place settings (Block et al., 2004; Irvine et al., 2004; Oenema et al., 2005; Mills et al., 2007; Robroek et al., 2007). The majority of work-place nutrition interventions have focussed on promoting changes in a limited number of outcomes such as fruit, vegetable and fat consumption (Steyn et al., 2009; Mhurchu et al., 2010). To our knowledge, only one small-scale, web-based intervention has promoted the Mediterranean diet and demonstrated favourable changes in several components of this dietary pattern among healthy employees in Scotland (Papadaki and Scott, 2005a, 2005b, 2008). However, this study was conducted only among female employees, thus not allowing the generalizability of the results.

Mixed-White and Black African
Other Black background
Caucasian

Adherence to the Mediterranean diet

Adherence to the Mediterranean diet was assessed via an 11-item food frequency questionnaire that requested participants to report the frequency of consumption of 11 main components of the Mediterranean diet (Panagiotakos et al., 2006a). A composite Mediterranean diet score was calculated as follows: for the consumption of components commonly consumed in the Mediterranean diet (non-refined cereals, potatoes, fruits and fruit juice, vegetables and salad, legumes and fish), a score of 0 (lowest adherence) to 5 (highest adherence) was assigned when a participant reported consumption of 0, 1–4, 5–8, 9–12, 13–18 and ≥18 servings/month, respectively. For the consumption of components which are consumed less frequently in the Mediterranean diet (red meat and meat products, poultry and whole-fat dairy products), a score of 0 to 5 was assigned for reported consumption of the above options, using a reverse scale. A score of 0 to 5 was assigned for consumption of <300 ml/day, a score of 0 for ‘no consumption or consumption of >700 ml/day’, and scores of 4 to 1 for consumption of 300–400 ml, 400–500 ml, 500–600 ml and >600 ml/day, respectively (Panagiotakos et al., 2006a). The resulting total score ranged from 0 to 55, with calculated tertiles indicating low (score = 0–21), moderate (score = 21–35) and high (score = 36–55) adherence to the Mediterranean diet (Panagiotakos et al., 2004, 2006b). The questionnaire has been validated based on the relationship between the calculated total score and individual food component scores and has been suggested to offer a valid method for assessing Mediterranean diet adherence and providing dietary modification advice for primary prevention purposes (Panagiotakos et al., 2006a, 2006c). In addition to having previously been utilised in Mediterranean diet promotion interventions in non-Mediterranean populations (Sexton et al., 2013).

Statistical analyses

Descriptive statistics (M, SD, N and %) were used to explore demographic and personal characteristics, internet usage patterns and eating habits of participants. Independent samples t-tests and Chi-square tests were used (with a P-value adjusted, as necessary, for multiple-paired
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Differences between genders were examined using the Chi-square test.

* This was corrected for potential non-independence using Bonferroni adjustment (resulting $P < 0.00238$).
Differences between genders were examined using the Chi-square test. Although this inclusion criterion might exclude employees who reported food frequency questionnaire to calculate the Mediterranean diet adherence. This study showed that the majority of participating working adults had moderate adherence to the Mediterranean diet and 39% of participants had high adherence to the diet. These findings agree with a previous Scottish study, where 36% of participants had a high Mediterranean diet score at baseline (Papadaki and Scott, 2005a). The examination of individual food components revealed that higher mean scores were achieved for vegetables, fruit and non-refined cereals. In addition, the majority of participants achieved high adherence scores for these components, which might reflect the exposure of UK consumers to national campaigns and promotion initiatives for higher consumption of these foods in recent years (Levy, 2013).

Although the results suggest overall moderate compliance with the Mediterranean diet by the sample population, there were a number of elements of the diet that had poor compliance. A very low proportion of participants achieved high adherence scores for legumes, fish and dairy products, as well as red meat, poultry and olive oil. There is a lack of intervention studies promoting the recommended consumption of these foods in free-living individuals in the UK. Legumes, for example, are included in the ‘non-dairy sources of protein’ category of the current UK dietary guidelines, along with meat, fish and eggs (Harland et al., 2012). The recommendation to eat some foods from this group on a daily basis, with no mentioning of the specific amount of legumes to be consumed (Public Health England, 2013), might result in increased intake of meat, as suggested by the current findings. The reported low intake of fish corresponds to the average UK intake (Bates et al., 2012), whereas the low adherence to the olive oil recommendation might stem from the limited reference to olive oil consumption in the UK guidelines (Public Health England, 2013), which is in contrast to the Mediterranean diet recommendations (Willett, 2006).

Higher adherence to the Mediterranean diet was observed among higher educated participants, compared to those with lower levels of education. This is in agreement with earlier literature which has linked higher levels of education to healthier diets and adherence to dietary recommendations (Darmon and Drewnowski, 2008). It is noteworthy that married participants and those who shared food preparation with family members had higher Mediterranean diet scores, compared to those who were single or had sole responsibility for food preparation, in order to improve their adherence to the Mediterranean diet.

A major strength of this study is that it complies with current frameworks of behaviour change intervention development by assessing the evidence base and needs of the target population prior to intervention design (Kok et al., 2004; National Institute for Health and Clinical Excellence, 2007; Craig et al., 2008; World Health Organisation, 2009). A limitation is its cross-sectional design and that the use of a self-reported food frequency questionnaire to calculate the Mediterranean diet score might be subject to recall bias. In addition, our sample consisted of a self-selected group of healthy employees with internet access. Although this inclusion criterion might exclude employees with lower education, it was not possible to collect data from employees who did not have internet access.

**Table 3**

| Component of the Mediterranean diet | Total | Females | Males | P<sup>ab</sup> |
|-------------------------------------|-------|---------|-------|--------------|
| Total Mediterranean diet score (%)  | 33.81 (5.42) | 33.95 (5.45) | 33.45 (5.33) | 0.32 |
| Non-refined cereals adherence (%)   | 4.28 (1.22) | 4.23 (1.27) | 4.42 (1.06) | 0.09 |
| Potatoes adherence (%)              | 3.28 (1.29) | 3.27 (1.33) | 3.30 (1.19) | 0.74 |
| Fruits adherence (%)                | 4.08 (1.41) | 4.10 (1.41) | 4.01 (1.39) | 0.49 |
| Vegetables adherence (%)            | 4.47 (0.93) | 4.53 (0.89) | 4.31 (1.01) | 0.014 |
| Legumes adherence (%)               | 2.02 (1.34) | 1.94 (1.33) | 2.22 (1.34) | 0.027 |
| Fish adherence (%)                  | 1.81 (1.19) | 1.83 (1.22) | 1.77 (1.10) | 0.59 |
| Red meat adherence (%)              | 2.42 (1.47) | 2.5 (1.51) | 2.19 (1.33) | 0.026 |
| Poultry adherence (%)               | 2.21 (1.48) | 2.23 (1.54) | 2.17 (1.30) | 0.64 |
| Whole-fat dairy adherence (%)       | 1.46 (1.54) | 1.47 (1.58) | 1.41 (1.44) | 0.65 |
| Olive oil adherence (%)             | 3.23 (1.38) | 3.16 (1.40) | 3.41 (1.32) | 0.050 |

**Discussion**

Higher adherence to the Mediterranean diet was observed among higher educated participants, compared to those with lower levels of education. This is in agreement with earlier literature which has linked higher levels of education to healthier diets and adherence to dietary recommendations (Darmon and Drewnowski, 2008). It is noteworthy that married participants and those who shared food preparation with family members had higher Mediterranean diet scores, compared to those who were single or had sole responsibility for food preparation, respectively, indicating potential family influences on dietary behaviours. Involving the family has been established as a component of effective work-place interventions (World Health Organisation, 2009), since potential food-related family interactions could provide support for participants while benefiting other family members as well (Ebbeling et al., 2002). This suggests that future work-place interventions should engage participants’ families. This could be achieved by developing and distributing newsletters and involving family members in study-related work-place events (e.g. cooking demonstrations) (World Health Organisation, 2009). Such interventions should also explore and target potential barriers faced by single participants or those with sole responsibility for food preparation, in order to improve their adherence to the Mediterranean diet.
with no internet access from participating, we believe that this would not limit the inclusivity of our study, since all of the participating work-places used electronic newsletters for information delivery to their employees, thus indicating wide internet access among all employees. Although the majority (58%) of participants were highly educated, our sample covered a relatively wide range of educational levels and occupations, therefore indicating the range of employees who might be willing to participate in work-place health promotion programmes. It was beyond the scope of the current study to assess physical activity. However, objective measures of physical activity should be collected in a future work-place nutrition intervention, as this variable might potentially confound the impact of the intervention. Although the response rate to the online survey was low (3.6%), we can- not ensure that all employees in each work-place accessed or read the study recruitment advertisements, which might have increased participation rates. Nevertheless, this hinders the ability to generalize our find- ings to the whole target population of adult employees in South West England.

Results suggest that future interventions promoting the Mediterranean diet in the UK might be best focussed on the promotion of legumes, fish and olive oil, replacing whole-fat dairy products with lower-fat versions and decreasing intake of red meat and poultry. This may be best targeted in a step-wise approach to change these compo- nents, in order to encourage gradual dietary behaviour changes, which are more likely to lead to long-term maintenance (Fletcher and Rogers, 1985). In addition, it has been suggested that there is a risk of people not being educated, our sample covered a relatively wide range of educational levels and occupations, therefore indicating the range of employees who might be willing to participate in work-place health promotion programmes. It was beyond the scope of the current study to assess physical activity. However, objective measures of physical activity should be collected in a future work-place nutrition intervention, as this variable might potentially confound the impact of the intervention. Although the response rate to the online survey was low (3.6%), we cannot ensure that all employees in each work-place accessed or read the study recruitment advertisements, which might have increased participation rates. Nevertheless, this hinders the ability to generalize our findings to the whole target population of adult employees in South West England.

Conclusion

Improvement in the consumption of several components of the Mediterranean diet is needed to increase adherence to this dietary pattern in this sample of adult employees. Findings from the current formative research can be used to inform the development of web-based interventions to promote the Mediterranean diet in work-place settings in South West England.

Conflict of interest statement

The authors declare that there are no conflicts of interest.

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Table 5

Differences in total Mediterranean score and percentage of participants achieving a high adherence to the Mediterranean diet according to demographic characteristics, South West England, UK (2014).

| Marital status               | Total Mediterranean diet score Mean (SD) | P     | Participants achieving high adherence to the Mediterranean diet n and % | P     |
|-----------------------------|----------------------------------------|-------|---------------------------------------------------------------------|-------|
| Married/cohabiting          | 34.22 (5.34)                           | 0.003 | 183 (41.1)                                                           | 0.211 |
| Single                      | 32.18 (5.66)                           |       | 27 (29.4)                                                            |       |
| Separated/divorced/widowed  | 33.18 (5.00)                           |       | 38 (36.0)                                                            |       |
| Level of education          |                                        |       |                                                                     |       |
| Degree or higher            | 34.70 (0.27)                           | <0.001| 153 (44.6)                                                           | 0.001 |
| Lower than degree           | 32.57 (0.37)                           |       | 75 (30.7)                                                            |       |
| Number of children living in household | 34.20 (5.30) | 0.782 | 155 (40.4)                                                           | 0.578 |
| None                        | 33.70 (5.30)                           |       | 73 (35.9)                                                            |       |
| Food shopping responsibility|                                        |       |                                                                     |       |
| I am                        | 33.50 (5.50)                           | 0.415 | 107 (37.3)                                                           | 0.812 |
| Family members              | 33.80 (5.40)                           |       | 19 (38.8)                                                            |       |
| Shared                      | 34.20 (5.30)                           |       | 102 (40.8)                                                           |       |
| Food preparation responsibility |                                      |       |                                                                     |       |
| I am                        | 33.10 (5.70)                           | 0.011 | 89 (34.9)                                                            | 0.155 |
| Family members              | 33.90 (5.30)                           |       | 19 (32.2)                                                            |       |
| Shared                      | 34.50 (5.10)                           |       | 120 (44.1)                                                           |       |

Differences were examined using the Chi-square test.

a Range of total Mediterranean diet score = 0–55.

b High adherence to the Mediterranean diet was defined as having a total Mediterranean diet score of 36–55.
