



The effect of complex workplace dietary interventions on employees' dietary intakes, nutrition knowledge and health status: a cluster controlled trial



Fiona Geaney ^{*}, Clare Kelly, Jessica Scotto Di Marrazzo, Janas M. Harrington, Anthony P. Fitzgerald, Birgit A. Greiner, Ivan J. Perry

Department of Epidemiology and Public Health, University College Cork, 4th Floor, Western Gateway Building, Western Road, Cork, Republic of Ireland

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ABSTRACT

Background. Evidence on effective workplace dietary interventions is limited. The comparative effectiveness of a workplace environmental dietary modification and an educational intervention both alone and in combination was assessed versus a control workplace on employees' dietary intakes, nutrition knowledge and health status.

Methods. In the Food Choice at Work cluster controlled trial, four large, purposively selected manufacturing workplaces in Ireland were allocated to control (N = 111), nutrition education (Education) (N = 226), environmental dietary modification (Environment) (N = 113) and nutrition education and environmental dietary modification (Combined) (N = 400) in 2013. Nutrition education included group presentations, individual consultations and detailed nutrition information. Environmental dietary modification included menu modification, fruit price discounts, strategic positioning of healthier alternatives and portion size control. Data on dietary intakes, nutrition knowledge and health status were obtained at baseline and follow-up at 7–9 months. Multivariate analysis of covariance compared changes across the four groups with adjustment for age, gender, educational status and other baseline characteristics. Results: Follow-up data at 7–9 months were obtained for 541 employees (64% of 850 recruited) aged 18–64 years: control: 70 (63%), Education: 113 (50%), Environment: 74 (65%) and Combined: 284 (71%). There were significant positive changes in intakes of saturated fat (p = 0.013), salt (p = 0.010) and nutrition knowledge (p = 0.034) between baseline and follow-up in the combined intervention versus the control. Small but significant changes in BMI (−1.2 kg/m² (95% CI −2.385, −0.018, p = 0.047) were observed in the combined intervention. Effects in the education and environment alone workplaces were smaller and generally non-significant.

Conclusion. Combining nutrition education and environmental dietary modification may be an effective approach for promoting a healthy diet and weight loss at work.

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1. Introduction

The World Health Organisation (WHO) Global Action Plan for the Prevention and Control of non-communicable diseases (NCDs) 2013–2020 is focused on reaching specific targets to achieve a global goal of reducing NCD deaths by 2% per year and a halt in the increase of obesity and type 2 diabetes (WHO, 2013). Aside from smoking and physical activity, diet is a major contributor to the development of these diseases (WHO, 2013). Diets that are low in saturated fat, sugar and salt (target

to reduce to 5 g per person per day) were among the priority cost-effective interventions highlighted at the UN High Level Meeting on NCDs in September 2011 (Beaglehole et al., 2011). It is accepted that the surrounding environments in which individuals live and work influences their health behaviours and that modifying these environments at both macro and micro levels is an important catalyst for behaviour change (Hollands et al., 2013; Das and Horton, 2012; Roberto et al., 2015; Kleinert and Horton, 2015). In particular, 'choice architecture' (based on the nudge theoretical perspective) is now recognised as a potentially valuable approach to influencing health related behaviours (Hollands et al., 2013; Regulating, 2011; Thaler and Sunstein, 2008).

The workplace has been recognised by the WHO as a priority environment to influence dietary behaviours given that individuals can spend up to two-thirds of their waking hours at work (WHO, 2013). In our previous review, there was limited evidence to suggest that workplace dietary modification interventions alone or in combination

Abbreviations: WHO, World Health Organisation; NCDs, non-communicable diseases; FCW, Food Choice at Work study; IPAQ, International Physical Activity Questionnaire; NetWisp, net weighed intake software program; SPSS, Statistical Package for the Social Sciences; MANCOVA, multivariate analysis of covariance.

^{*} Corresponding author.

E-mail address: f.geaney@ucc.ie (F. Geaney).

with nutrition education can increase fruit and vegetable consumption (Geaney et al., 2013a). Four out of six studies reported small increases in fruit and vegetable consumption (\leq half serving/day). These studies involved workplace dietary modifications and three incorporated nutrition education. However, many of these interventions relied mainly on information provision and did not include potentially valuable nudging environmental strategies such as food modification. The interventions documented in the literature were of generally low intensity and poorly evaluated (Geaney et al., 2013a). Given the sub-optimal study designs, weak process evaluations and the lack of cost-effectiveness evaluations, it was difficult to draw definite conclusions on the effectiveness of workplace dietary interventions (Geaney et al., 2013a).

The aim of the Food Choice at Work (FCW) study was to assess the comparative effectiveness of a workplace environmental dietary modification intervention and a nutrition education intervention both alone and in combination versus a control workplace. It was hypothesised that the combined intervention (environmental dietary modification and nutrition education) of high intensity would be more effective than either intervention alone or no intervention in promoting positive changes in employees' dietary intakes, nutrition knowledge and health status outcomes. The combination of multiple components of environmental dietary modification and nutrition education and the implementation of these components on multiple levels within the workplace (system level: changes within the eating environment, employee level: individual nutrition consultations) formed this high intensity intervention.

2. Methods

2.1. Food Choice at Work intervention design

Details of the study design, intervention elements and methods of the FCW study have been published previously (Geaney et al., 2013b). Briefly, a cluster controlled trial was conducted in four large multinational manufacturing workplaces in Cork, Ireland. All participants were informed that they were involved in a university-led study designed to observe employees' dietary behaviours. In the control workplace, data was collected at baseline and follow-up. Nutrition education was provided in the second workplace (Education). Environmental dietary modification alone was implemented in the third workplace (Environment). The combined intervention which included nutrition education and environmental dietary modification was implemented in the fourth workplace (Combined). The complex intervention design was developed and evaluated using the MRC framework for 'Developing and evaluating complex interventions: new guidance' (Craig et al., 2008). The four phases of the framework included (A) development, (B) feasibility and piloting, (C) evaluation and (D) implementation (Craig et al., 2008). Details regarding the application of the framework were published in the study protocol (Geaney et al., 2013b).

The complex interventions complied with a soft paternalistic "nudge" theoretical perspective and a social ecological perspective where the interventions created positive reinforcement with indirect suggestions for healthy food choices to improve the employees' dietary behaviours (Regulating, 2011; Thaler and Sunstein, 2008; Bronfenbrenner and Bronfenbrenner, 2009; Baranowski et al., 2003; Stokols, 1996). Nutrition education comprised of three elements: monthly group nutrition presentations, detailed group nutrition information (daily traffic light menu-labelling and monthly posters, leaflets and emails) and individual nutrition consultations. Each participant attended three individual nutrition consultations (at baseline, follow-up at 3–4 months and follow-up at 7–9 months) (Geaney et al., 2013b). The individual nutrition counselling provided the employees from the combined intervention with personalised knowledge that enabled them to make healthy food choices within a modified workplace environment when compared to the other interventions (education alone and environment alone).

Environmental dietary modification included five elements: (a) menu modification: restriction of saturated fat, sugar and salt, (b) increase in fibre, fruit and vegetables, (c) price discounts for whole fresh fruit, (d) strategic positioning of healthier alternatives and (e) portion size control. Environmental engineering approaches were guided by 'choice architecture' (Thaler and Sunstein, 2008). For example, repositioning of certain healthy foods within the canteen supported habit disruption with the potential to trigger conscious thoughts (i.e. confectionary products were replaced with healthy snacks (fresh fruit, dried fruit, natural nuts) by the cash registers in the eating environments and in the vending machines) (Geaney et al., 2013b).

The intervention design was developed by the research team and advised by catering stakeholders. All environmental dietary modification elements were discussed with the catering stakeholders and a consensus was reached. For example, the research team suggested 3 chip free days but 2 chip free days was agreed. The research team also worked with the workplace stakeholders (human resources and catering managers) to implement the specific interventions within the context of the individual workplaces. Each workplace had a research workplace leader based on-site who collaborated with the workplace stakeholders to co-ordinate the data collection and monitor adherence to the interventions. Monthly observation visits (45 min per visit) were conducted by the research workplace leader without prior warning. Nutrition education displays and the eating environments (including the kitchen and vending machines) were carefully observed to ensure that there was constant compliance with all elements. Non-compliance was not observed in the different worksites during the trial period.

2.2. Sampling

Only workplaces that employed >250 employees; operated a daily workplace canteen and were able to commit to the intervention elements for the study duration were eligible. A list of Cork based manufacturing companies was obtained from the Irish Industrial Development Authority website ($n = 107$) and was systematically screened for eligibility over the phone in alphabetical order. From the overall list, the research team organised meetings with a total of 20 potentially suitable companies to discuss the feasibility of participating in the study. The four most suitable workplaces were then purposively selected and allocated to each intervention by the research team to ensure that all workplaces were able to fully comply with all of the intervention elements for the study duration.

Only permanent, full-time employees who purchased and consumed at least one main meal from their workplace canteens daily were eligible. Employees were excluded if they did not work in the workplace full-time (for example, worked from home 2 days a week); travelled regularly for work (\geq once a month); were medically advised not to participate in the study; were on long-term sick leave, pregnant or were involved in an on-going diet programme external to work (for example, Weight Watchers). Complete lists of permanent, full-time employees were obtained from the human resources manager in each workplace. All employees were screened for eligibility over the phone by the research team. Employees were randomly contacted using random number generation software (Microsoft Excel) and invited to participate if eligible.

2.3. Determination of sample size

The number of employees recruited per workplace was proportionate to company size. The sample had 80% power at the 5% significance level to detect a 2 g average fall in dietary salt intake and a decrease in BMI by 1 kg/m² between the control and intervention groups post-delivery of the interventions (Geaney et al., 2013b). Fig. 1 illustrates the recruitment process throughout the study period.

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