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Workplace delivery of a dietitian-led cardiovascular and type 2 diabetes prevention programme: A qualitative study of participants' experiences in the context of Basic Needs Theory

Running head: Workplace delivery of a dietitian-led programme

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## **Abstract**

The Medical Research Council recommends strong theoretical underpinning in the design and evaluation of lifestyle intervention programmes (LIPs). This qualitative study aimed to use Basic Needs Theory (BNT) as a framework to explore participants' perspectives on a workplace dietitian-led LIP. Specifically, experiences with LIP engagement, and initiation and maintenance of behaviour change were evaluated. Fifteen semi-structured face-to-face interviews were conducted with participants who had previously completed a workplace cardiovascular disease and type 2 diabetes prevention programme, which involved advice and motivational support with making dietary and lifestyle changes. Interviews were audio recorded and transcribed verbatim. To evaluate the narrative, interpretative phenomenological analyses was used with BNT as the theoretical framework. A total of 12 themes were identified in relation to the concepts of BNT – autonomy, competence and relatedness – and organised into three domains: intervention engagement, behaviour change initiation and behaviour change maintenance. Line manager and colleague support to attend was reported to have a strong influence on intervention engagement, and the importance of dietitian and peer guidance in initiating behaviour changes was highlighted. Differences between participants who maintained behavioural changes compared to those who relapsed, included autonomously seeking support (relatedness) through family, friends, health care professionals and commercial slimming organisations. BNT provided an insightful theoretical framework to evaluate factors that underpinned the effectiveness of a dietitian-led cardiovascular and type 2 diabetes prevention LIP. Attendance and retention in workplace LIPs can depend on participants' managerial and colleague support, so recruitment processes should consider targeting managers in marketing and promotional activities. Workplace LIPs may increase the likelihood of behaviour change maintenance by including methods that foster longer term participant relatedness and emotional support.

Keywords: type 2 diabetes, obesity, weight loss, cardiovascular disease, weight maintenance

Behaviour change programmes with educational dietary and physical activity related components are commonly referred to as lifestyle intervention programmes LIPs (see Groeneveld *et al.* 2010) and have demonstrated beneficial outcomes in type 2 diabetes (T2D) and cardiovascular disease (CVD) (*e.g.* Look AHEAD Research Group 2014). In preventive studies, LIPs for obesity, with weight-loss of up to 10% of bodyweight, have reported improvements in risk factors for T2D and CVD (*e.g.* Lindström *et al.* 2006). Tuomilehto and colleagues' (2001) early LIP study of those with impaired glucose tolerance demonstrated 58% reduced T2D incidence over 4 years in the LIP group ( $n=256$ ) compared to controls ( $n=250$ ). Knowler *et al.* (2002) reported that LIPs can have a more profound effect on reducing T2D risk compared to pharmacological intervention (Knowler *et al.* 2002). In addition, systematic reviews of LIPs have reported clinically significant improvements in hypertension and hypercholesterolaemia (Aucott *et al.* 2009; Aucott *et al.* 2011). International guidelines recommend that individuals identified as at high risk of CVD and/or T2D should be offered intensive multifactorial interventions that foster lasting behaviour changes and health improvements (Paulweber *et al.* 2010; Perk *et al.* 2012).

Numerous studies have demonstrated the workplace as a useful site to identify high-risk individuals and provide effective LIPs (Soler *et al.* 2010). Despite the intensive nature of LIPs, review studies suggest that their implementation can be economical (Saha *et al.* 2010) and the National Institute for Health and Clinical Excellence (NICE 2012) has called for research into the components of LIPs (*e.g.* method of delivery, ease of access to intervention, practitioner's communication style) that contribute toward further cost effectiveness. Adults in the UK can spend up to 60% of their waking hours at the workplace (Department of Health 2005), making this micro-environment the 'ideal target' for cost effective interventions (Baicker *et al.* 2010). Over 30 million people are employed in the UK, many of which are in large organisations, such as the NHS in the public sector, and industrial workers in the private sector (Office for National Statistics 2017). Targeting large organisations offers access to many people and the opportunity to reduce the health and economic burden associated with premature death from CVD (Soler *et al.* 2010). According to Smith and colleagues (2016), many workplace LIP studies have been conducted in the US, Australia and Europe with comparatively few reported in the UK. Where such UK studies have taken place, qualitative investigation into their effectiveness has been lacking, resulting in limited understanding of the effective components of UK workplace LIPs (Power *et al.* 2014).

In order to elucidate the components leading to the initiation and maintenance of favourable behaviour changes related to healthy eating and physical activity, the Medical Research Council recommends the use of theory in the design and evaluation of complex interventions (Moore *et al.* 2014). To support this type of work, a multinational collaboration has produced a specific behaviour change taxonomy (Michie *et al.* 2013) for the systematic design and evaluation of behavior change interventions. Practitioner style has been demonstrated to be a key determinant of outcomes in teaching and LIPs (NICE 2012; Edmunds *et al.* 2008). The most beneficial components of practitioner style are believed to be empathic communications, which are central to motivational interviewing (MI; Miller & Rollnick 2012). MI in group LIPs is becoming more common and the use of theory to evaluate MI interventions is

recommended (Wagner & Ingersoll 2013). Self-Determination Theory (SDT), a theory of motivation, has been proposed as an explanation for the success of MI and recommended to be used in intervention design and evaluation (Vansteenkiste *et al.* 2012). SDT is considered a ‘metatheory’ of five theories and despite its complexity it has been used as a framework in health care programme evaluations (*e.g.* Wasserman 2010). Basic Needs Theory (BNT), a sub-theory of SDT, focuses on the realms of autonomy (the freedom of choice without external coercion), relatedness (the need for psychological belongingness and connectedness with others and their environment) and competence (the perceived ability to perform and in time ‘master’ a behaviour), as key factors to maintain psychological ‘wellness’ and develop intrinsic motivation (*i.e.* acting for the inherent satisfaction of the activity itself; Martela *et al.* 2017).

Compared to other behavioural theories, the three realms of BNT make it simple and adaptable for use as an evaluative framework of LIPs that use MI techniques (Joseph *et al.* 2016). By considering the realms of BNT, researchers can interpret participant perspectives on LIP components to identify factors that enhance or thwart behavioural outcomes (Vansteenkiste *et al.* 2012). In addition, BNT also considers psycho-social factors that promote extrinsic motivation (*i.e.* performing an activity in order to obtain a separable outcome), which is associated with shorter term behavioural changes (Ryan *et al.* 2008). Using BNT as a theoretical framework, this study aimed to explore participants’ experiences of a workplace LIP designed to reduce risk of developing CVD and T2D. Specifically, we explored the psycho-social dynamics associated with intervention uptake and retention, and the initiation and maintenance of behaviour changes.

## **Methods**

### *Background to the lifestyle intervention programme*

A multi-agency project – Prosiect Sir Gâr – formulated a standard operating procedure for CVD and T2D risk assessment, which was conducted on staff at three occupational departments: an industrial steel works and two general hospitals in the South Wales Region of the UK (Gray *et al.* 2014). The LIP was developed in conjunction with the risk assessment and delivered at the workplace of staff by the project dietitian and physical activity specialist. Staff were offered the LIP depending on the clinical outcomes of the risk assessment (Table 1). The LIP structure was based on the IMAGE-prevention toolkit (Lindström *et al.* 2010) and adapted using specific behaviour change techniques described by Abraham and Michie (2008) (see Table 2 for overview of behavior change techniques used). The LIP was delivered using MI strategies (*e.g.* empathic reflective listening, paraphrasing, group affirmations) and the MI ‘spirit’ – which emphasises the importance of respecting participants’ autonomy by ‘guiding’ as opposed to ‘directing’ and insisting on behaviour changes (Miller & Rollnick 2012). The aim of the LIP was to promote long-term lifestyle changes related to healthy eating and physical activity. The LIP consisted of four stages: 1) face-to-face discussion with the dietitian; 2) group intensive stage; 3) face-to-face ‘appraisal’; and 4) group maintenance stage (Figure 1). The dietitian was independently assessed for MI skills using the Motivational

Interviewing Treatment Integrity (MITI) scale (Pierson *et al.* 2007) and was proficient in MI. A physical activity specialist accompanied the delivery of the LIP for one session of the group intensive stage. To aid LIP recruitment, project stakeholders engaged with senior management from both organisations to obtain official permission for staff to attend the LIP during working hours. As reported by Gray *et al.* (2014), 562 and 228 people participated in the risk assessment at the two hospital sites and steel works, respectively, with 333 eligible for the LIP. The LIP was delivered to 72 participants grouped into 11 cohorts (each cohort consisted of 3-8 participants) from March 2010 to December 2012. Gray *et al.* (2014) reported that 36 participants completed the LIP up to the appraisal stage, a 50% retention rate, with significant improvements in bodyweight after 8 weeks post-LIP (mean -1.7 kg, standard deviation  $\pm 2.5$  kg).

### *Recruitment to the study*

Purposive sampling techniques were adopted to gather 'information rich' cases (Draper & Swift 2011) which involved targeting: 1) men and women who had completed the LIP intensive sessions; 2) participants who had attended at least one of the maintenance sessions post-LIP; and 3) participants that had initiated behavior changes (*e.g.* weight loss). Potential participants were contacted and invited to interview at least one year following completion of the LIP intensive stage. Those whom expressed an interest in the study were provided with written information regarding the study and then given time to decide whether to opt in or out. Interviews were organised at a convenient time for those giving consent to participate. Fifteen participants comprised the study sample and, during the interviews, reported weight changes were documented as a proxy of behaviour change (Table 3). The majority of the study sample were female ( $n = 12$ ), all were white British and the average age of participants was 52 years (SD  $\pm 6.2$ ). Interviews began in February 2013 and ended in June 2013, following ethical approval from Swansea University Research Ethics Committee and Wales Research Ethics Committee 7 (reference number: 11/WA/0101). The lack of eligible males meant recruitment was halted before attaining data saturation. In the current study, participant's mean body weight loss post-LIP was 2.4 kg and 5 of the 15 study participants reported weight loss of  $\geq 3$  kg at the time of interview, up to 18 months post LIP (Table 3).

### *Study design*

The first author adopted a post-positivist stance for the development and implementation of the study. The post-positivist focuses on objectivity but accounts for human perceptions – which are subjective – in the interpretation of the world (Robson 2011). This stance supports a qualitative design for studying psycho-social phenomenon because it accepts subjectivity and permits participants to express truth and meaning from their views and experiences (Richie & Lewis 2003). The researcher maintained field notes and evaluation reports of each LIP cohort to improve the credibility of the study design via triangulation – which involved multiple methods of data collection (Robson 2011). To direct the investigation, previous work – in the form of a systematic qualitative review of workplace LIPs – was used to develop the

interview guide (see supplementary material) for face-to-face interviews (Di Battista *et al.* 2013). Sections of the interview guide remained semi-structured in order for participants to express their views and experiences but were formulated to direct discussions toward programme engagement, and factors associated with behaviour change.

### *Data collection and analyses*

All interviews were digitally recorded by the dietitian from the LIP (first author) and conducted in a confidential environment at the workplace. Interviews with participants lasted between 32 and 70 minutes with a mean of 50 minutes. The interview guide included questions on motivation for attending the LIP, and experiences of LIP and behaviour change (see supplemental material). Interviews were transcribed verbatim by the first author and salient narrative was identified using interpretive phenomenological analysis (Richie & Lewis 2003; Vansteenkiste *et al.* 2012). Factors associated with participant motivation and behaviour change were clustered into the realms of BNT (autonomy, competence and relatedness). Upon compiling the salient narrative into the three realms, descriptive themes were deductively produced and organised into a coding tree using the three study interests: intervention engagement, behaviour change initiation, and behaviour change maintenance (Tong *et al.* 2007). The first author conducted all the primary data interpretation and to ensure data credibility and validity the study supervisor was presented with the findings and raw data during frequent debriefing sessions (Guba & Lincoln 1994). The purpose of these meetings was to discuss ideas and interpretations, and enable the primary researcher to identify personal biases and adjust thinking accordingly. These discussions formed reasoning and directed deductive analyses by comparing data across the three BNT realms. Themes were developed and co-authors were invited to comment on a series of drafts, which enhanced internal validity and form consensus on the study outcomes.

## **Results**

A total of 12 descriptive themes were identified in relation to the concepts of BNT (autonomy, relatedness and competence), and assigned to three domains: intervention engagement, behaviour change initiation and behaviour change maintenance (see Tables 4, 5 and 6). Twelve participants stated that their main aim for attending was weight management, and the remainder to improve cholesterol profiles. Weight loss of 3 kg has been associated with maintenance of dietary and physical activity changes (see Gillison *et al.* 2015), so this degree of weight loss was used as a proxy for behavior change maintenance in the current study. All participants who reported a minimum of 3 kg weight loss at the time of interview (approximately 18 months post-intensive phase) were therefore highlighted as behavior change ‘maintainers’ (noted in Table 3 with an asterisk; *e.g.* P1\*) in order to contrast their reports with participants who relapsed. An overview of the salient narrative representing participants’ experiences of the LIP and consequent behaviour changes is presented below in the three domains of BNT: autonomy, relatedness and competence.

### *Autonomy*

Participants reported attending the LIP because of the convenience of the LIP at the workplace and their deep desire for support with behaviour change to reduce their risk of CVD and/or T2D. Participants described their time at the LIP as non-patronising, interesting and fun; factors associated with autonomy and intrinsic motivation (Martela *et al.* 2017). Five participants described continuing to focus on habits and goals (as taught in the LIP) to maintain behaviour change and/or weight-loss up to one year post-LIP. They reported being able to control lapses of behaviour change in a matter of fact manner and get back to their 'plan' when needed (Table 4).

Reported barriers to weight-loss maintenance included life pressures that triggered emotional stress (*e.g.* physical injuries, illness, job changes and financial pressures). Participants who reported to have 'slipped' (*i.e.* unable to maintain weight-loss) described the programme as 'enjoyable' and 'worthwhile'. Interestingly, they maintained one or two behaviour changes that they perceived to have more immediate benefit compared to weight loss (*e.g.* improved mental alertness) but discontinued self-monitoring practices (*e.g.* managing lapses, regular weight monitoring, goal setting) and did not continue with weight-loss maintenance due to feeling deprived of certain foods.

*'I wasn't very good at eating breakfast but I have changed that and I do have breakfast every day now... I've kept that up because I found I was feeling better in the morning... I did try and do more healthy eating and try not to eat chocolate and that sort of thing. I have... slipped back'* (P11, female, age 57)

### *Relatedness*

Discussions of social factors and workplace culture were raised to address the notion of relatedness, which is posited to facilitate behaviour change (Table 5; Ryan *et al.* 2008). Despite an eagerness for support, participants reported poor expectations of the LIP, based on experiences with commercial slimming classes and negative preconceived perceptions of dietitians (*i.e.* slim and likely to be judgmental). Staff were permitted to attend the LIP during work hours (by senior management) but some reported experiencing sources of conflict (*e.g.* their supervisors' disingenuous permission to attend and colleagues disingenuous support to attend). Participants described feeling emotions of guilt for leaving their work, conflicts that appeared to diminish perceptions of relatedness. To compensate, motivated participants attended in their own time or made promises to work the time back.

*"It needed to be a bit more that work were happy for you to go ... It did feel like a bit, 'well you want to do it, go in your own time', sort of thing. I think only once I came when I was on duty"* (P2\*, female, age 58)

In relation to experiences of the LIP, of the 15 participants, 13 indicated strong levels of relatedness among peers within the group, highlighting the group interaction as beneficial for

initiating behaviour change. When there was a common goal (*i.e.* weight-loss) participants indicated that they built relationships with their peers and were there to discuss their experiences and challenges rather than solely learn from the practitioner. A strong sense of group relatedness was generally described, which improved motivation to attend and participants' perceived self-confidence when planning behaviour change.

*“It was like (the practitioner), ‘right what do you think you need to do?’ You were asking us and... getting us to say what we think, and then obviously you get more input from other people... You’ve got their input as well and you think ‘I could try that’; other peoples hints and tips...”*  
(P14\*, female, age 45)

### *Competence*

When discussing the group sessions, participants stated that a combination of the themed sessions helped them consider how to initiate and maintain behaviour change (*e.g.* sessions on food labels, goal setting, habits and emotional eating). Participants reported the food labeling discussions and materials as the most helpful and beneficial to making decisions regarding healthier food products. Methods of goal setting were described to assist with making behaviour changes and particular ‘tools’ given during the LIP were described as helpful. For example, the behavioural resources that encouraged introspection on hunger, and how the environment influences eating, were perceived to aid eating regulation.

*“The ‘How hungry are you from one to ten’ that often comes into my mind. Are you really hungry, you know, do you think you really need that extra biscuit (light chuckle). You know, to look one-to-ten on a scale of how hungry you are, that’s really helpful”* (P14\*, female, age 45)

Once the LIP had ended, two participants described ‘slipping up’ and sought help with self-competence by joining commercial slimming organisations for weekly support. Ten participants did not maintain behavior changes following the LIP and seven felt they needed ongoing social or professional support

*“Looking at myself and looking at other people who would have been in the same boat. I would have thought, you do need continuous (group sessions)... because you can lose that thought (to eat healthy) very easily... suddenly, your outlook changes then if you’re not having the support. (So) you go back down the road ‘I might as well have this now, it doesn’t matter does it?’”* (P4, female, age 56)

The five participants who maintained behaviour changes reported positive social relationships and self-monitoring practices (*e.g.* weighing or monitoring food intake) as helpful in establishing habits and enabling guilt free flexibility to enjoy indulgent foods.

*'You can't maintain it forever, you know, life has got to be fun as well. You know, you've got to be able to go out and enjoy yourself, socialise with other people but then it's knowing actually that today can be a boring day and just cut back'* (P12\*, female, age 54)

## **Discussion**

The results describe participants' experiences attending a workplace group LIP and their efforts to initiate and maintain behavioural change. The domains of BNT – autonomy, competence and relatedness – provided a framework to understand the benefits and shortfalls of the LIP, and the barriers and facilitators to initiate and maintain behavioural change.

### *Autonomy*

The workplace presents an opportunity to deliver health promotional messages and influence staff culture (Aldana *et al.* 2013). Participants were signposted to the LIP following CVD risk assessment at occupational health but no prior health promotional messages or marketing strategies were implemented to promote the LIP, which could have helped recruit more people to the original LIP as participants expressed eagerness for support (Laws *et al.* 2016). Participants in the current study reported a strong desire for support with lifestyle changes and an urgency to improve their health following the results of the CVD risk assessment. Numerous studies have implemented a risk assessment approach to LIP recruitment (see Soler *et al.* 2010) and this study suggests that this can motivate people to attend a workplace LIP. On completing the LIP, participants reported positive views on the dietitians' delivery style, which they believed supported their choice to set goals (autonomy).

### *Relatedness*

The workplace environment can have a strong influence on obesity risk (Burgoine 2014). Participants in the current study perceived their line manager and colleagues as barriers to LIP attendance. The Boorman Report suggests that the line manager has a strong influence on staff participation in workplace health programmes and it is recommended that workplace LIPs are made convenient and accessible (Boorman 2009; Lakerfield *et al.* 2008; Laws *et al.* 2013). In certain cases, and contrary to expectations, providing 'formal' permission to attend the LIP in work hours did not enhance perceptions of autonomy to attend, suggesting that line managers need direct targeting to encourage staff attendance. Such targeting could involve training line managers in basic communication methods to encourage people to engage with health services (Lawrence *et al.* 2014) or developing resources for line managers about the importance of helping their staff maintain good health; for example by encouraging them to attend a workplace LIP (*e.g.* Lundmark *et al.* 2017).

In our study, participants who maintained their behavioural change ( $n=5$ ) reported having more positive social support (relatedness) after the intervention compared to the majority of those ( $n=7$ ) who relapsed ( $n=10$ ). In these cases, support was provided by family, friends,

healthcare professionals, and/or commercial slimming organisations. When participants struggled to maintain behaviour change but were motivated to continue, relatedness (in the form of social support) appeared to increase feelings of self-competence (or self-confidence) and allow them to continue maintaining their behavior changes (Murray *et al.* 2013). Previous interventions have harnessed the behavioural benefits of formulating peer-support networks (Walker *et al.* 2012) and such forms of community engagement can be implemented into workplace programmes to increase the likelihood that behavior changes will be maintained (Cherrington 2012; West 2014).

### *Competence*

Specific behaviour change techniques (*e.g.* goal setting and planning, comparing outcomes, shaping knowledge) can enhance the outcome of LIPs (Schröder *et al.* 2014; Dombrowski *et al.* 2012). In our study, participants highlighted particular intervention techniques that improved their knowledge and perception of competence to change behaviour: food labeling information cards, portion size booklets, and practical information (*e.g.* using a hunger score to control snacking behavior). However, the majority of participants did not maintain behavior changes ( $n=10$ ), suggesting the LIP did not support intrinsic motivation to continue with the lifestyle changes in the longer term (Ryan & Deci 2008). Participants felt they needed an external pressure (*e.g.* continuous weight maintenance sessions) or someone to be accountable to (*e.g.* practitioner) in order to help them regulate their behaviours and maintain changes (Baldassarre *et al.* 2014). The most common reasons for wanting external accountability were associated with perceptions of low self-competence in weight-loss maintenance, other life priorities, and a desire for ‘bad’ foods. Other studies have reported similar findings when participants lack confidence to continue and want long-term support for weight-loss maintenance, suggesting social networks can be important for behaviour change maintenance (Penn *et al.* 2008; Hindle & Carpenter, 2011; Penn *et al.* 20013).

### *Strengths and limitations*

The semi-structured interview guide and rapport with the interviewer, evident in the interview transcripts, enabled participants to express their story and highlight LIP components important to them (Draper & Swift 2011). Participants were interviewed approximately 18 months following the initial group programme. This time-frame facilitated understanding of their longer term experiences with behavioural changes but reduced the reliability of participants’ recall of the initial LIP, although participants did recall specific intervention components rather than general effects.

All participants were of white British origin, with the majority being women ( $n=12$ ), limiting the generalisability of the findings. Most of the participants accessed the LIP to manage obesity and were not necessarily ‘high risk’ of CVD and/or T2D although were categorised as having an increased risk. The participants’ main health concerns were aligned to the general problems associated with obesity (*e.g.* painful joints) and this may have influenced their motivation to engage with the LIP, and consequently the views gathered may be more

generalisable to participants with obesity rather than those with a high risk of CVD and/or T2D. However, the results obtained are insightful for developing lifestyle intervention programmes, as obesity is increasingly common and a significant risk factor for CVD and T2D (Morrish *et al.* 2001; Swinburn *et al.* 2011).

### *Practice implications*

To the author(s) knowledge this is the first UK study to qualitatively evaluate a dietitian-led workplace LIP. BNT informed the evaluation and helped to identify 12 themes associated with initiation and maintenance of behavior changes related to healthy eating and physical activity. Contrary to expectations, our findings suggest that perceptions of autonomy to attend the LIP did not improve by offering ‘time off’ from work when external work pressures remained. Self-monitoring activities were reported as key to behaviour change maintenance and weight loss in our workplace LIP. When participant’s self-competence (or self confidence) was perceived to diminish, seeking social support (relatedness) was consistently reported as important for maintaining behaviour changes. This study advances understanding of factors underpinning successful workplace LIPs and stakeholders can utilise our findings to improve the design and implementation of such programmes.

### *Conflicts of interest*

The authors declare that they have no conflicts of interest.

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Figure 1. Stages of the lifestyle intervention programme (Gray *et al.* 2014)

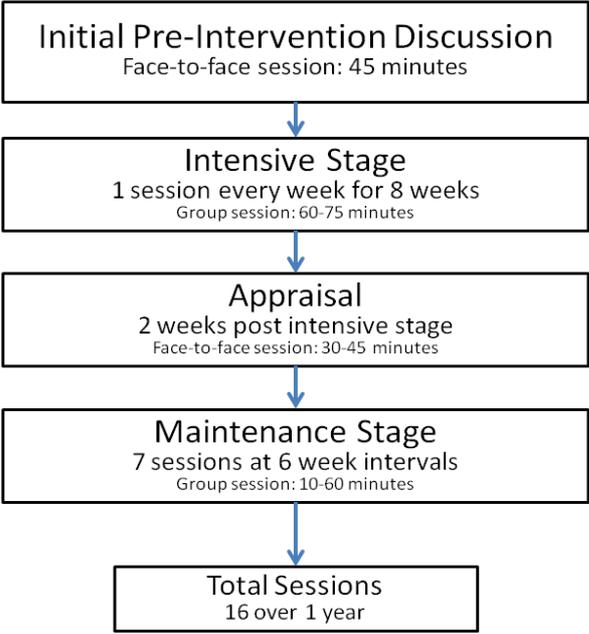


Table 1

Access criteria to the lifestyle intervention programme

Risk assessment result	Clinical indication
*QRISK2 Score $\geq$ 20%	High risk of cardiovascular disease
†QDiabetes Score $\geq$ 20%	High risk of type 2 diabetes
Glycated Hemoglobin (HbA1c) 42 – 46 mmol/mol (6.0 – 6.4%)	Impaired glucose regulation
Body mass index above 30 kg/m <sup>2</sup> (Caucasian) or 27.5 kg/m <sup>2</sup> (Ethnic minorities)	Obesity

Note: Participants were offered the intervention if *any* of the above risk factors were identified

\*QRISK2 is a validated cardiovascular screening tool developed by QResearch Nottingham (Hippisley-Cox *et al.* 2008)

†QDiabetes is a validated diabetes screening tool developed by QResearch Nottingham (Hippisley-Cox *et al.* 2009)

Table 2

Format of the lifestyle intervention programme and examples of behaviour changes techniques used

Session agenda	Exploratory themes	Behaviour change techniques as described by Michie <i>et al.</i> (2013)
Assessment: One-to-one	Experiences with risk assessment at occupational health; work commitments; readiness for change; acceptability of group environment	<ul style="list-style-type: none"> <li>• Social support (practical, general, emotional)</li> <li>• Self-belief – focus on past success</li> <li>• Identity – self affirmation, reframing, cognitive dissonance</li> <li>• Comparison of outcomes – pros and cons</li> </ul>
Session 1: Introduction	Personal experiences and expectations	<ul style="list-style-type: none"> <li>• Self-belief – focus on past success</li> <li>• Shaping knowledge – instruction on how to perform a behaviour</li> <li>• Natural consequences – health, social, environmental, emotional, and salience consequences.</li> </ul>
Session 2: Healthy eating	Food groups; controlling portions; food recipes/cooking	<ul style="list-style-type: none"> <li>• Comparison of behaviour – social comparison</li> <li>• Shaping knowledge – behavioural experiments</li> <li>• Restructuring the social and physical environment</li> </ul>
Session 3: Food labels	Shopping and making healthier choices	<ul style="list-style-type: none"> <li>• Repetition and substitution – behaviour rehearsal/practice</li> <li>• Antecedents – restructuring the social and physical environment</li> <li>• Shaping knowledge – instruction on how to perform a behaviour</li> </ul>
Session 4: SMARTER goals	Setting goals; barriers to change; making lifestyle changes	<ul style="list-style-type: none"> <li>• Goals and planning – problem solving/coping planning, commitment, goal setting (behaviour and outcome), review behaviour and outcome goals</li> <li>• Shaping knowledge – instruction on how to perform a behaviour</li> </ul>
Session 5: Habits and emotional eating	Exploring triggers; behaviours and change	<ul style="list-style-type: none"> <li>• Self-belief – self talk, focus on past success, verbal persuasion to boost self-efficacy</li> <li>• Social support (practical, general, emotional)</li> </ul>

Session 6: Physical activity (lead by physical activity specialist)	Becoming more active; walking; exercise referral schemes	<ul style="list-style-type: none"> <li>• Repetition and substitution – behaviour substitution, habit reversal, habit formation, behavioural rehearsal/practice</li> <li>• Reward and threat – anticipation of future rewards or removal of punishment</li> <li>• Goals and planning – commitment, discrepancy between current behaviour and goal standard, goal setting (behaviour)</li> <li>• Shaping knowledge – instruction on how to perform a behaviour</li> </ul>
Session 7: Cardiovascular risk factors	An overview the lifestyle links; alcohol; stress; smoking	<ul style="list-style-type: none"> <li>• Natural consequences – health, social, environmental, emotional, and salience consequences, self-assessment of affective consequences, anticipated regret</li> <li>• Self-belief – self talk, focus on past success</li> </ul>
Session 8: Maintaining lifestyle changes	Exploring and controlling relapse	<ul style="list-style-type: none"> <li>• Self-belief – self talk, focus on past success</li> <li>• Regulation – conserving mental resources, regulate negative emotions</li> <li>• Reward and threat – social reward, self-reward, material reward</li> </ul>
Appraisal: One-to- one	Experiences of the groups; successes to date; on-going goals; feasibility of maintenance and attending ‘drop-in’ sessions	<ul style="list-style-type: none"> <li>• Social support (practical, general, emotional)</li> <li>• Self-belief – focus on past success</li> <li>• Identity – self affirmation, reframing, cognitive dissonance</li> <li>• Comparison of outcomes – pros and cons</li> </ul>

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Table 3

Details of the participants and weight changes following the lifestyle intervention programme

Participant	Sex	Work hours (full time = 37.5 hours weekly, part time <37.5 >18.5 hours)	Age (years) (mean = 52 years)	BMI on intervention entry (kg/m <sup>2</sup> ) (mean = 33.58 kg/m <sup>2</sup> )	Bodyweight pre- intervention (kg) (mean = 90.68)	Bodyweight changes at 10 week appraisal (kg) (mean = -2.4)
1*	F	Part time	51	35-40	102.00	-5.30
2*	F	Part time / shifts	58	35-40	104.70	-7.20
3	F	Part time	46	35-40	94.8	-3.50
4	F	Full time / shifts	56	25-29	75.2	-3.80
5	M	Full time	57	30-34	93.2	-0.80
6*	M	Full time	49	35-40	111.50	-3.10
7	M	Full time	44	35-40	123.50	-1.50
8	F	Full time	58	35-40	95.2	+0.50
9	F	Full time	60	20-24	61.14	+1.60
10	F	Full time	47	30-34	80.30	+0.50
11	F	Full time	57	30-34	84.90	-0.80
12*	F	Full time	54	30-34	93.60	-3.90
13	F	Full time	44	35-40	100.2	-3.00
14*	F	Part time	45	30-34	82.1	-6.70
15	F	Full time	61	25-29	57.80	+1.1

\*Participants who reported a minimum weight-loss maintenance of 3 kg at time of interview – approximately 18 months post programme

Table 4

Participant quotations and themes associated with the autonomy realm of Basic Needs Theory

Domain	Theme	Participant quotation
Intervention engagement	Convenient intervention access	P12*: 'It was convenient. It wasn't too long out of my working day. You know, I could go over there, see you, go back to work and I wasn't missed, you know'  P6*: 'Well, you get offered help, in your works time, you know, offered help to reach a goal you've always had. I knew I needed to do it, I got offered help so, it was a no brainer for me it was, 'OK, great. Let's take the help' There was nothing to lose by it, you know'
Intervention engagement	Managerial and/or colleague support to attend	P2*: 'It needed to be a bit more that work were happy for you to go and allowed you, worked it in. I don't know. It did feel like a bit, well you want to do it, go in your own time sort of thing. I think only once I came when I was on duty. The rest of the time I worked it, I asked for that day off or I asked for a late shift so that I knew I'd have the morning free'
Behaviour change initiation	Psycho-social pressures and autonomy to engage with behaviour changes	P13: ...'once I've got a little bit more money, a little bit more time, less stress at home, I'll be able to. I want to change my lifestyle then and get into a sort of routine to sort of get healthier'
Behaviour change maintenance	Personal food preparation and workplace food availability	P8: 'We all had a good moan about the fact that we were pretty much prisoners on our sites... but we are where we are, so you bring it (food) with you. But (there are) the temptations of having a bad day... and buying a (chocolate) bar.'
Behaviour change	Habit formation	P1*: 'I lost a couple of stone, yeah... increased exercise and maintained those (activities). Uhm,

maintenance

and behavioural  
defaults

changed my eating habits but strangely enough I don't think so much about what I eat now because I think by making healthy choices and sticking to them for a while, it's the sort of thing you go for then'

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Table 5

Participant quotations and themes associated with the relatedness realm of Basic Needs Theory

Domain	Theme	Participant quotation
Intervention engagement	Relational anxieties and obesity stigma	<p>P12*: 'I have to say, I was quite hesitant, you sort of sign up for it in there and um you're not quite sure what you're signing up for. You're not sure if you're going to be sitting in a circle and talking about how fat you are or being lectured to'</p> <p>P3*: 'Yeah, I didn't want to be told off, 'Why have you got to this weight?' I was quite prepared to do something about it obviously, hence why I came but I think it's that initial [fear]...'</p> <p>P13: 'I was expecting an ogre (regarding the practitioner) but umm I've got to say, great no problem, put my mind at ease straight away. Umm, there were no condescending approaches or anything. Great'</p>
Behaviour change initiation	Practitioner engagement style and fostering peer support	<p>P2*: 'You (the practitioner) did make it quite interesting. Umm and it was quite fun, without being that sort of feeling of being in school (light laughter)... It was just, yeah, it wasn't like regimented, it wasn't... you weren't made to feel like you were all lined up in a school room'</p> <p>P14*: "It was like, 'right what do you think you need to do?' You were asking us and um getting us to say what we think and then obviously you get more input from other people and what you think maybe the right way is the wrong way. You've got their input as well and you think 'I could try that', other peoples hints and tips and things like that really"</p>
Behaviour change maintenance	Continued professional, social, and family support	<p>P4: "Looking at myself and looking at other people who would have been in the same boat. I would have thought, you do need continuous (group sessions)... because you can lose that thought (to eat healthy) very easily... suddenly, your outlook changes then if you're not having the support. (So) you go back down the road 'I might as well have this now, it doesn't matter does it?'"</p>

Table 6

Participant quotations and themes associated with the competence realm of Basic Needs Theory

Domain	Theme	Participant quotation
Behaviour change initiation	Nutrition knowledge and perceptions of self-control	P7: 'The fact that I know that there is a salt content and that there is information on the side of foods that you buy and so on... That it exists I know there is a way of controlling things, getting back to the controlling your life' P3: 'My awareness has increased big time but I think I don't always practice what I learnt in the group. I think the changes as well is I'm more aware of (what to do to lose weight), but I don't practice it, of keeping an eye on my weight'
Behaviour change maintenance	Hunger perceptions and eating regulation	P14*: "The 'How hungry are you from one to ten' that often comes into my mind. Are you really hungry, you know, do you think you really need that extra biscuit (light chuckle)? You know, umm to look one-to-ten on a scale of how hungry you are, that's really helpful"
Behaviour change maintenance	Perspectives on behavioural lapses and consequential regulation	P3: "Knowing I had eaten a lot and thinking 'Oh, what's the point in going because I know the scales are going to say I've put on weight'. So, losing the momentum and the focus, just losing motivation" P12*: 'You can't maintain it forever, you know, life has got to be fun as well. You know, you've got to be able to go out and enjoy yourself, socialise with other people but then it's knowing actually that today can be a boring day and just cut back'
Behaviour change maintenance	Perceived effort and reward of maintaining eating habits	P11: 'I wasn't very good at eating breakfast but I have changed that and I do have breakfast every day now... I've kept that up because I found I was feeling better in the morning... I know that when I don't have breakfast I don't feel awake at all. I did try and do more healthy eating and try not to eat chocolate and that sort of thing. I have... slipped back.'