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Functional Imagery Training, a novel, theory-based motivational intervention for weight-loss

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**UNIVERSITY OF
PLYMOUTH**

**Functional Imagery Training, a novel, theory-based
motivational intervention for weight-loss**

By Linda Solbrig

A thesis submitted to the University of Plymouth in partial fulfilment
for the degree of

DOCTOR OF PHILOSOPHY

School of Psychology

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Abstract

Linda Solbrig

Functional Imagery Training, a novel, theory-based motivational intervention for weight-loss

This thesis investigates the acceptability and efficacy of Functional Imagery Training (FIT), a motivational intervention for weight-management. FIT is based on Elaborated Intrusion Theory, delivered in the style of Motivational interviewing (MI), and designed to promote sustained behaviour change and address cravings. It trains the habitual use of affective, goal-directed mental imagery of personal incentives, using imagery to plan behaviours, anticipate obstacles, and mentally try out solutions from previous successes. Participants are taught to update their imagery from their experience, and to generalise their imagery skills to new goals.

In **study 1**, focus groups explored problems and wishes in regards to weight-management, including reactions to Functional Imagery Training (FIT) as a possible intervention. The issue of waning motivation and the desire for motivational app support was expressed in all groups. Participants were positive about FIT.

Study 2 was an uncontrolled pilot trial of FIT. Eleven out of 17 participants (65%) lost 5% body weight or more by three months. Participants continued to lose weight during an unsupported 12-month period and experienced mean weight loss of 6kg (SD= 5.7; $d=1.06$) and mean waistline reduction of 11.5 cm (SD= 7.4; $d=1.56$) at 15 months.

Study 3 compared the impact of FIT with MI on motivation and self-efficacy, over the first month of a randomised controlled trial (RCT) for weight-loss. Structured elicitation and training in goal-related imagery, i.e., FIT, increased motivation and self-efficacy for weight-loss relative to MI.

Study 4 was the RCT for weight-loss, comparing FIT and MI over an intervention-supported six-month period, followed by six months unsupported. The FIT group achieved clinically meaningful weight-loss at 6 months (M kg-loss=4.11) and continued weight-loss at 12 months (M kg-loss=6.44); the MI group stabilised by 12 months (M kg-loss=.67), after minimal weight loss at 6 months (M kg-loss=.74).

Study 5 qualitatively explored experiences of MI and FIT RCT participants, upon completing the 6-month intervention phase. MI participants wished for continued therapist-support and feared relapse. FIT participants described a mind-set-change and were confident they could maintain changes and overcome challenges using imagery techniques.

Given the demonstrated benefit of motivational imagery in weight-control, FIT should be considered and further tested as an intervention for health behaviour change.

Author's declaration

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award without prior agreement of the Doctoral College Quality Sub-Committee. Work submitted for this research degree at the University of Plymouth has not formed part of any other degree either at the University of Plymouth or at another establishment. A programme of advanced study was undertaken, which included taught modules taken, other as relevant. This study was financed with the aid of a studentship from NIHR CLHARC South West Peninsula. Relevant scientific seminars and conferences were regularly attended at which work was always presented; several papers were published, are under review, or in preparation.

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List of abbreviations:

ANCOVA = Analysis of Covariance

ANOVA = Analysis of Variance

APP = Application (computer)

BABCP = British Association for Behavioural and Cognitive Psychotherapies

BMI = Body Mass Index

CI = Confidence Interval

cm = Centimetre

CONSORT = Consolidated Standards of Reporting Trials

d = Cohen's d effect size, also known as Standardise Mean Difference

DF = Degrees of Freedom

e.g. = Exempli Gratia, for example

EI theory = Elaborated Intrusion theory

EPIC Norfolk = The European Prospective Investigation of Cancer

et al. = Et Alia

F = F -statistic

FFQ = Food Frequency Questionnaire

FIT = Functional Imagery Training

GP = General practitioner

GQOL = Global Quality of Life Scale

GSE = Generalised Efficacy Scale

i.e. = Id Est, in other words

JA = Jackie Andrade

Kg = kilogram

Look AHEAD = Action for Health in Diabetes

LS = Linda Solbrig

LSD = Least Significant Difference post-hoc test

M = Mean

m = Metre

m² = Metres Squared

MANOVA = Multivariate Analysis of Variance

MARS rating scale = Mobile Application rating scale

MCMC = Markov Chain Monte Carlo estimates from Bayesian model fits

MI: Motivational Interviewing

MITI = Motivational Interviewing Treatment Integrity code

MP3: Moving Picture Experts Group Layer-3 Audio

MRC: Medical Research Council

MTF = Motivational Thought Frequency Scale

MTF-ALCOHOL = Motivational Thought Frequency Scale for Alcohol

MTF-DP = Motivational Thought Frequency Scale - Diet and Physical activity

NHS = National Health Service

NICE: The National Institute for Health and Care Excellence

NIH = National Institute of Health

NIHR = The National Institute for Health Research

NWCR: National Weight Control Registry

P = Participant

p = Probability value

PA = Physical Activity

PHE: Public Health England

QALY = Quality-Adjusted Life-Years

R = Programming language primarily used for statistical computing

RA = Research Assistant

RCT: Randomised Controlled Trial

SCI ESE = Spinal Court Injury Exercise Self-Efficacy Scale

SD = Standard Deviation

SMART = Specific, Measurable, Action-Orientated, Realistic, Timed

SMD = Standardized Mean Difference, also known as Cohen's d

TV: Television

Type M Error = Magnitude Error

UK: United Kingdom

US = United States

V1 = Primary Visual Cortex

WEL = Weight Efficacy Lifestyle Questionnaire

WHO: World Health organisation

WMD = Weight Mean Difference

η^2 = Eta squared

Chapter 1: Introduction

This chapter introduces the background, current issues and suggests potential approaches to solutions, then lists the aims and objectives of this research. The last section outlines the remaining chapters of the thesis.

1.1 Background: Obesity and inactivity

In England, 24% of adults have obesity and a further 36% have overweight (Smith & Smith, 2016)¹. Obesity is a leading cause of premature mortality worldwide because individuals affected are at risk of developing serious morbidities, such as Type 2 diabetes, cancers and various musculoskeletal and cardiovascular conditions (Eastwood, 2013). Obesity is a risk factor in numerous mental health problems, particularly in mood disorders, such as depression (Booth, Roberts, & Laye, 2012; McElroy et al., 2004; Onyike, Crum, Lee, Lyketsos, & Eaton, 2003).

Treating obesity and its direct consequences cost the NHS in England £5.1 billion in 2014/15, a trend that is rising substantially, with three in four adults predicted to be obese by 2035 (Bhimjiyani, Knuchel-Takano, & Hunt, 2016). Obesity does not solely impact individuals and health care systems negatively, it also incurs indirect costs, through decreases in workforce productivity, affecting employers and the economy as a whole (Lehnert, Sonntag, Konnopka, Riedel-Heller, & König, 2013).

People with overweight or obesity are generally more likely to be inactive (Puhl & Heuer, 2010), which makes its own contributions to ill health (Lee et al., 2012). According to the World Health Organisation (WHO), physical inactivity is the principal cause of 27% of type 2 diabetes and 30% of heart disease (Vanhees et al., 2012). Regular physical activity helps to prevent and manage over 20 chronic life style conditions and can also

¹ We consider overweight and obesity as treatable conditions rather than personal attributes. We use language accordingly, as recommended by journals such as *Obesity*, referring to 'individuals with overweight or obesity' rather than 'overweight or obese individuals'. There have been similar moves in psychology to refer to people with mental illnesses as, for example, 'individuals with schizophrenia' rather than 'schizophrenics'.

improve cognitive function, sleep, self-esteem, and psychological health (Booth et al., 2012; Vanhees et al., 2012). Self-reported levels of physical activity however suggest that only 29% of women and 39% of men in England get an adequate amount of exercise. When objective measures are used, only 4% of women and 6% of men meet government recommendations (Mindell et al., 2012). The National Institute for Health and Clinical Excellence (NICE) therefore recommends developing interventions to address diet and physical activity together (NICE, 2017a). Randomised controlled trials that incorporate diet and physical activity have produced moderate weight loss, compared with smaller effects when only one or the other was a focus (Catenacci & Wyatt, 2007).

Relatively small changes in weight (5% reduction) can bring clinical improvements (Donnelly et al., 2009; Jakicic et al., 2001; Wing et al., 2011). In individuals with overweight and obesity, a sustained weight reduction of only 2-5 kg can reduce cardiovascular risk factors and prevent progression to type 2 diabetes mellitus (Espeland, 2007; Tuomilehto et al., 2001; Williams et al., 2012).

However, obesity is a complex problem and there is no reliable model that can fully explain the interplay of environmental, physiological, genetic and behavioural factors involved. Viewing obesity as a simple problem of energy expenditure versus caloric intake is over-simplifying the issue (Rutter, 2011). It is not only about the balance between energy in/energy out: it is easier to gain than to lose weight. Our bodies adjust physiologically, to change in diet, in the direction of energy conservation (Swinburn et al., 2011). This means that initial weight loss progress is followed by a period of stability which can be demotivating and subsequently result in re-gain. Therefore, it is important not only to encourage people to adopt healthy diets but also to support their motivation to stick to them because the main barrier to weight-loss maintenance appears to be poor adherence to behavioural regimens and physiological adaptations that promote weight regain (MacLean et al., 2015).

The array of interventions for reducing weight and increasing physical activity spans education and advice, lifestyle and behavioural interventions, pharmacological treatments and bariatric surgery. If patients seek help they will be treated according to the 4 tiers of the UK obesity pathway (figure 1).

Figure 1. UK obesity care pathway and commissioning responsibilities from April 2016 (Barth, 2015):

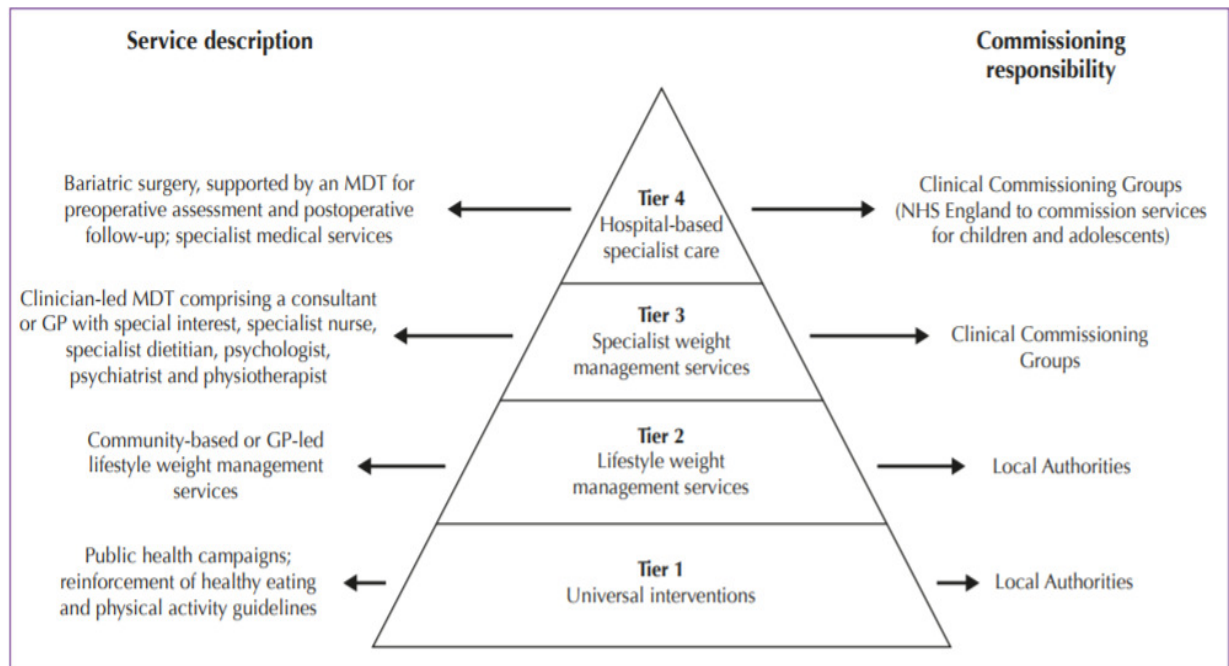


Figure 1. UK obesity care pathway and commissioning responsibilities from April 2016. MDT=multidisciplinary team.

Tier 1 is aimed at people who are overweight, defined as having a body mass index (BMI) between 25 and 29. BMI is calculated as weight in kg divided by height in m². Tier 1 is primary care led, based on brief advice and information provided by GPs, nurses, health visitors and leisure services. Tier 2 (BMI >30) consists of community-based obesity services, or a referral to commercial weight loss programmes usually delivered by exercise therapists, or dietitians. The NHS relies on Tier 3 (BMI >40) and 4 to form a pathway leading from specialist care to bariatric surgery. Patients cannot receive NHS provided bariatric surgery unless they have undergone a two-year period of specialist care first (Barth, 2015).

Bariatric surgery, drug treatments and very low-calorie diets pose the risk of life threatening side effects and a significant minority of patients typically do not reach their desired weight (Encinosa, Bernard, Steiner, & Chen, 2005; Encinosa et al., 2013; Picot et al., 2009). Patients who receive bariatric surgery have to adhere to strict nutritional guidelines for the rest of their lives, to avoid dangerous complications (Sarwer, Dilks, & West-Smith, 2011). A quarter of the initial weight loss following bariatric surgery is typically regained over 6–10 years (Sjöström, 2013). Those individuals who receive drug-therapy on average only experience modest weight-loss (Rucker, Padwal, Li, Curioni, & Lau, 2007) and will eventually have to adopt a healthy lifestyle to maintain weight-loss as permanent treatment is impossible. Adding lifestyle-based group support to pharmacological treatments significantly increases weight-loss compared to drug-therapy alone (Wadden, Berkowitz, Sarwer, Prus-wisniewski, & Steinberg, 2001).

We know that the extent to which energy intake and inactivity can impact the development of obesity in individuals is influenced by genetic mutations, making some individuals more susceptible to weight-gain than those without such mutations (Marti, Moreno-Aliaga, Hebebrand, & Martínez, 2004). Additionally, genotype appears to influence how well some individuals respond (Marti et al., 2004). However, large population studies such as EPIC Norfolk (Li et al., 2010) have shown that lifestyle changes specifically increased physical activity, was associated with a 40% reduction in the effect of the genetic predisposition to common obesity, amongst 20450 individuals that had been identified to be genetically susceptible to developing obesity. We also know that the expression of type 2 diabetes is due to genetic, behavioural and environmental risk factors, but routinely responds well to life-style interventions that increase activity and reduce weight (Williams et al., 2012). Based on the current, convergent evidence, it can be suggested that the root cause of obesity, or interplay of several causes, requires a multi-component and individualised approach. The importance of lifestyle in weight-

management is incontrovertible. Even individuals who undergo bariatric surgery and those with genetic predisposition to obesity benefit from lifestyle change.

Even though a number of effective lifestyle-interventions and essential behavioural intervention elements for weight loss have been identified (Greaves et al., 2011; Mchie et al., 2011) and initial reductions can be achieved by many commercial and other lifestyle-focused programs (Ahern et al., 2017; Hartmann-Boyce, Johns, Jebb, Summerbell, & Aveyard, 2014; Truby et al., 2006), weight re-gain is the norm (Dansinger, Tatsioni, Wong, Chung, & Balk, 2007; Dombrowski, Knittle, Avenell, Araújo-Soares, & Sniehotta, 2014). Significant amounts of weight are routinely regained following non-surgical interventions. On average one third of initial weight lost, is regained within 12 months and the rest over a typical time-frame of 3-5 years (Dansinger et al., 2007; Dombrowski et al., 2014; Wadden et al., 2005). So, most people, who complete a tier 1 or 2 lifestyle-orientated intervention do not maintain meaningful levels of weight loss.

Weight loss maintenance has been reported mainly in high-intensity lifestyle interventions that provided comprehensive weight loss counselling for up to 8 years (Wadden, 2014), or in trials that delivered at least 6-18 months of extended care, with therapist contact, after the successful completion of a weight loss program (Ross Middleton, Patidar, & Perri, 2012). Few studies document weight loss past the end of treatment, making it difficult to draw conclusions about personal and intervention-based factors that support lasting weight loss (Kozica et al., 2015).

Partly maintained weight-loss has been self-reported in fairly selective populations, such as the National Weight Control Registry (NWCR) which tracks over 10,000 individuals who have lost weight and kept some off for long periods of time. Detailed questionnaires and follow-up surveys are used annually, to examine the behavioural and psychological characteristics of weight maintainers, as well as the strategies they use to maintain weight-loss (Thomas, Bond, Phelan, Hill, & Wing, 2014). Wing and Phelan

(2005), for example, analysed over 4000 records from the NWCR and found that only about 20% of individuals who lost at least 10% of body weight (registry sign up requirement) on average managed to maintain that weight-loss after one year. Many individuals are able to maintain some of the weight loss they initially achieved though: 87% of 2886 individuals demonstrated, at 10-year follow up, that they were able to keep on average 77% of the original weight loss maintained. This was especially true for those individuals who had experienced high initial weight loss that had been maintained up to and beyond two years (Thomas et al., 2014). An important, but challenging, target is therefore maintaining weight loss in the period immediately after an initial intervention has ended, as maintenance here predicts long term success in weight management. Some of the frequent behaviours associated with maintained weight loss in Thomas et al. (2014) and Wing and Phelan (2005), were high levels of physical activity, eating a low-calorie diet, self-monitoring weight, and maintaining a consistent eating pattern across weekdays and weekends (Wing & Phelan, 2005). All of these behaviours require sustained motivation, but qualitative data show that lack of motivation is a commonly reported barrier to weight loss and weight loss maintenance, along with stress, depression and situational factors like food cravings (Sharifi, Mahdavi, & Ebrahimi-Mameghani, 2013), lack of control, and lack of time (Welsh et al., 2013).

1.2 A motivational approach for sustained lifestyle-changes

Preventing weight re-gain after initial weight-loss is crucial and should be an important focus of weight-management programmes (MacLean et al., 2015). A key issue with maintaining the benefits from weight-loss interventions is that participants struggle to stay motivated (Sabinsky, Toft, Raben, & Holm, 2007; Sharifi et al., 2013). Motivation is an integral part of behaviour change and the maintenance of functional behaviours (Bandura, 1977; Elfhag & Rössner, 2005; Miller & Rollnick, 2012; Ryan, Patrick, Deci, & Williams, 2008). Current weight-loss programmes (for tier 2) typically focus on lifestyle education,

advice and some behavioural skills (e.g. prompt self-monitoring, prompt specific goal-setting, provide feedback) (NICE; National Institute for Health and Clinical Excellence, 2017b). This approach is recommended by government initiatives, such as Public Health England and the National Institute for Health and Clinical Excellence (NICE; National Institute for Health and Clinical Excellence, 2017a; Public Health England, 2017). These programmes place relatively little emphasis on directly addressing motivation (West et al., 2011).

Elfhag et al. (2005) compiled a conceptual review of factors associated with weight loss maintenance, where maintenance was defined as intentional weight-loss that had been maintained for a minimum of six months. They identified that weight-loss maintenance was associated with an internal motivation to lose weight and self-efficacy which forms the part of motivation that boosts an individual's confidence they can perform a behaviour to achieve a desired outcome (Bandura, 1977). Mata et al. (2009), for example found that general self-determination (Ryan & Deci, 2000) as well as exercise-specific motivation predicted dietary regulation and physical activity over a 12-month weight loss trial. Self-motivation predicted engagement with and success on a very low calorie weight loss programme over 23 months (Williams, Grow, Freedman, Ryan, & Deci, 1996) and weight loss outcomes over three years (Silva et al., 2011). Self-efficacy is associated with successful adherence to dietary changes (Dennis & Goldberg, 1996; Dutton, Martin, Rhode, & Brantley, 2004; Linde, Rothman, Baldwin, & Jeffery, 2006) and weight maintenance (DePue, Clark, Ruggiero, Medeiros, & Pera, 1995; Elfhag & Rössner, 2005). Strategies to strengthen motivation and self-efficacy should therefore form part of interventions for weight loss and weight management. Given motivation's central role in long-term weight control (Elfhag et al., 2005; Silva et al., 2011), motivational interventions may be an important addition to skills based and educational weight management approaches that commissioners should consider.

In the UK, until an individual is allocated to tier 3 weight management support, they cannot access treatments aimed at eliciting and increasing motivation, such as Motivational Interviewing (MI) (Miller & Rollnick, 2012), within primary care, or via free community-based support. Usual tier 2 weight-loss programmes range from 10-13 weeks of group-based weekly support, and sometimes include individual session (Borek, Abraham, Greaves, & Tarrant, 2018; NICE, National Institute for Health and Clinical Excellence, 2017b); brief motivational interventions could easily be added to such programmes, or deliver a cost-effective alternative. Some community-based weight-loss programmes like Eatwell (provided by Livewell Southwest (NHS)) include a brief session on motivation (20 minutes) at the start. They also encourage peer-support, goal-setting and self-monitoring, but the key focus is still nutrition and exercise education and some skill building (e.g. adapting recipes). The focus is therefore quite different from MI, where the aim is to encourage users to find their own solutions rather than advise them what to do.

Some recent support for adding dedicated motivational support to weight loss programmes comes from a systematic review by Gudzone et al., (2015). They reviewed the efficacy of popular commercial weight loss programmes, including for example Weight Watchers, Nutrisystem, and Jenny Craig. The Jenny Craig programme includes personalised motivational support, Participants on this programme achieved on average 4.9% more weight-loss over 12 months than those in behavioural counselling and an education control. Attrition was less than 20% in the three Jenny Craig trials included in the review, whereas other programme included suffered from higher attrition rates. Gudzone et al criticised all the trials for the absence of blinding, which could have introduced biases, and lack of follow up beyond 12 months. While there are programmes that work, they are at times long (Jenny Craig provides up to 8 years of support),

expensive and not everyone has access, so there is still a need to develop brief, effective motivational and accessible interventions.

MI is the best established standalone motivational intervention. It is a distinct combination of behaviour change techniques, including decisional balance, eliciting motivation, building self-efficacy, overcoming barriers and action planning for goal attainment. It is client-centred, collaborative decision making, delivered in a non-confrontational directive style that emphasises autonomy for behaviour change (Miller & Rollnick, 2012). The client safely explores and considers the benefits of change in an empathetic environment. Through a process of emphasizing the discrepancy between personal goals and current health behaviours, ambivalence about behaviour change is lessened and the client's attention is drawn to their own incentives and related desires for change. The emotional impact of these is magnified through empathic reflection from the therapist, increasing motivation because the client's intrinsic goals and values are now accessible. Self-efficacy is built by reviewing successful (even if partial) past attempts at behaviour change and by encouraging change talk, rather than sustain talk, which is typically composed of reasons why a certain change might be impossible at present, or perceived as unnecessary. Change talk supports confidence in being able to change because people are inclined to believe in what they hear themselves say and trust their own opinions more than that of others. If clients decide to change, their commitment is supported by formulating specific action plans and self-efficacy is further boosted by speaking of and finding solutions to immediate barriers to change (Miller & Rollnick, 2012).

MI is consistently better than standard advice-based controls in the treatment of numerous addictive and health related behaviours, when delivered in-person (Martins & McNeil, 2009; Rubak, Sandbaek, Lauritzen, & Christensen, 2005; Vanbuskirk & Wetherell, 2014), or remotely online (Shingleton & Palfai, 2015). MI has been shown to be successful in for example, adherence to medication (Zomahoun et al., 2016), chronic pain treatment

(Alperstein & Sharpe, 2016), improving cardio vascular health (Thompson et al., 2011), smoking cessation (Rubak et al., 2005), reducing compulsive gambling (Grant et al., 2009), increasing physical activity (O'Halloran et al., 2014), reducing excessive drinking (Vasilaki, Hosier, & Cox, 2006), reducing blood pressure (Vanbuskirk & Wetherell, 2014) and reducing substance use (Vanbuskirk & Wetherell, 2014).

Although MI (Miller & Rollnick, 2012) is the best established motivational intervention, trials that include MI to support weight loss or physical activity have to date only achieved modest to medium effects at follow-up (Armstrong et al., 2011; Barnes & Ivezaj, 2015; Hardcastle, Taylor, Bailey, Harley, & Hagger, 2013). For example, Barnes and Ivezaj (2015), systematically reviewed 24 adult randomised controlled trials in primary care settings, comparing motivational interviewing with usual care, in patients with a minimum BMI of 26. They found that only 13 studies reported an average 5% loss of initial body weight in MI interventions. Only nine out of 24 trials reported a significant weight loss advantage of MI compared to usual care (uncontrolled for attention and time), composed of standard dietary advice, recipes, self-monitoring, or progress tracking materials (paper, or online) (Barnes & Ivezaj, 2015).

Armstrong et al. (2011) conducted a meta-analysis of 11 adult RCTs comparing MI with controls, such as standard physical activity and diet advice/education, some therapist-time matched, in people with overweight and/or obesity. Unlike Barnes & Ivezaj (2015), trial inclusion was not limited to primary care-setting, but allowed inclusion from other research settings. Armstrong et al. (2011), reported an average body weight mean difference (WMD) of 1.47kg. This showed that MI significantly enhanced weight-loss, compared to controls; effect size for the clinically important percentage body-mass reduction however was only moderate (Standard Mean Difference, SMD =-.51). In consequence, MI's clinical significance for weight-loss is small-medium at best (Armstrong

et al., 2011; Hardcastle et al., 2013; Vanbuskirk & Wetherell, 2014; VanWormer & Boucher, 2004).

There is not enough certainty of the long-term effects of MI yet either. This makes it difficult to determine how fast effects decay after treatment ceases. The studies included in Armstrong et al. (2011), did not exceed 18 months and only one study of 12 months included a 6-month unsupported phase before weight was followed-up. Similarly, in Barnes and Ivezaj (2015) systematic review, weight change for the majority of trials was recorded upon completion of the intervention phase and only two studies included a follow-up after an un-supported period. The MI intervention length ranged most commonly from 3 to 6 months only.

A few RCTs have focused on MI-informed weight loss maintenance programmes, after initial weight loss is achieved (overwhelmingly in women). West, Gore, DiLillo, Greene & Bursac's (2007) conducted a RCT in obese women with type 2 diabetes. They compared MI support over 12 months (five 45-min individual sessions, delivered once every 3 months) compared with time-matched attention control. The control consisted of educational sessions. In addition, both groups received a weight-control programme (6 months, 42 session). The MI group lost statistically significantly more weight than control at 6 months, with weight-loss stabilising by 12 months. Weight-loss maintenance sessions were still provided after 12 months, but MI was withdrawn and participants started to re-gain rapidly between 12-18 months.

West et al. (2011) randomised 338 women with urinary incontinence to either a behavioural life-style focused, 6-month group-based, weight-loss programme (modelled on the Diabetes Prevention Programme (Wing, 2004) and the LOOK AHEAD trial (Wadden, 2014)), or a control. The control comprised seven educational group sessions within a structured protocol, providing general information about physical activity, healthy eating habits and weight loss. The women were followed over 18 months in total. Upon

completion of the initial weight-loss phase 226 women, who were in the behavioural life-style intervention arm, were randomised to either a 12-month motivation-focused (MI informed) weight-loss maintenance programme, or to a standard skill-based maintenance programme (both consisted of bi-weekly 60-minute group-sessions). Results showed that body percentage weight change at six months was on average between 7-8% in both the educational control and behavioural life-style intervention group. Percentage body weight-change in the motivation-focused maintenance group and the behavioural skill-based group at 18 months was on average between 4-5% and again, not statistically different between groups. Extensive extended motivational maintenance support for 12 months achieved to sustain clinically significant weight-loss maintenance at 18 months, but evidenced no advantage over a behavioural skill-based approach of same duration and intensity. Importantly, both intervention groups re-gained once the initial weight-loss induction programme had ceased (about 3% on average, between 6-18 months) which could not be prevented even with extensive maintenance support (West et al., 2011).

Coughlin et al., (2016) allocated 1032 overweight or obese adults (38% African American, 63% women) with hypertension, dyslipidemia, or both, to a 6-month group based behavioural weight-loss intervention. Upon completion, participants who had managed to lose at least 4kg body weight, were randomised to either a personal contact intervention, an interactive technology-based intervention (dropped before trial completed, due to producing no differences compared to self-directed control), or a self-directed weight-loss maintenance group (printed lifestyle guidelines with diet and physical activity recommendations were provided) for 30 months. The aim was to prevent weight-regain, reinforce original skills and education from the initial weight-loss programme and for those who wished to, to continue losing weight. The personal contact group received monthly 15-minute phone calls and every fourth month they attended an individual face-to-face session (45-60 minutes). All contact was provided by MI trained interventionists. Weight

re-gain started immediately after randomisation. Participants in the personal contact group re-gained less by 30 months follow-up (4kg on average) than participants in the self-directed group (5.5kg on average, WMD=-1.5kg). At 30 months participants from both, the self-directed and the personal contact intervention group, were randomised again, to either another 30 months of personal contact, or another 30 months of self-directed weight-loss maintenance. Weight outcomes by the end of 5 years were not significantly improved and similar across both groups. Only 37% of those initially assigned to receive 60 months of personal contact managed to stay 5% below their initial study entry weight, compared to 27% in the self-directed group. The clinical benefits on weight loss in this unique 5-year study were modest at best.

Dombrowski et al. (2014), in a recent review of non-surgical interventions for weight-loss maintenance, proposed that for a modest proportion of individuals weight re-gain could potentially be reduced by a rate of 1.6 kg per year. This was especially true when intervention techniques such as boosting self-regulation (successfully, autonomously guiding one's own behaviour towards achieving goals) and problem-solving (overcoming barriers), all of which MI addresses. But, unfortunately most individuals, even with help of these type of interventions will re-gain (Dombrowski et al., 2014).

Qualitative studies from individuals enrolled in, or after completion of behavioural weight loss programmes, might provide further important insights into the phenomenon of weight regain, due to a specific focus on their perspectives and experiences. A recent meta-analysis by Greaves, Poltawski, Garside, & Briscoe, (2017) thematically synthesised qualitative evidence in regards to the challenge of weight-loss maintenance from 26 studies (it has to be noted that in 5 out of these, weight-loss was achieved by bariatric surgery and not via a behavioural weight-loss programme). A total of 710 participants' experiences of having overweight and trying to prevent gain, or trying to manage weight-loss maintenance, were considered. Maintainers and regainers alike, typically described

weight-management as a 'constant battle'. They felt it zapped their mental effort and cognitive resources. Many participants mentioned that this growing toll on their faculties and the subsequent cognitive fatigue, led to instability in keeping up positive weight management behaviours. It also provided fertile ground for negative thought patterns, unmanageable food cravings, impulsive eating and poor coping skills, eventually resulting in relapse (Greaves et al., 2017).

Successful weight-loss maintenance (10% body-weight percentage loss, maintained at least for 1 year) was associated with new sources of motivation because the original sources (positive feedback from others, or noticeable improvements in physical fitness), during the active study period were noticed less over time. This was a problem for many individuals (especially regainers) who stated they needed more boosts to their 'willpower' and motivation. Across a number of studies, maintainers reported more intrinsic motivation (once 'external pushes' ceased) which was linked to enjoyment of lifestyle behaviours that mediated weight-control, such as for example taking pleasure in exercise (Greaves et al., 2017). These qualitative data suggest that motivations can change over time and that a focus on boosting intrinsic motivation might prove most essential to successful weight-loss maintenance (Greaves et al., 2017).

One of MI's main foci is to elicit and to build internal motivation for functional behaviour change. Yet, the quantitative data from weight-loss trials, especially when MI, or MI-derived behavioural support is provided (even extensively and long-term, up to 18 months) show that MI on average, only performs modestly better than standard educational and advice giving controls (WMD of 1.47kg) (Armstrong et al., 2011). Some research, like West et al., (2011) that focused on weight loss maintenance, has provided evidence that MI can perform equally well to behavioural skill-based weight-loss maintenance approaches (on average about 4-5% body weight percentage loss, maintained by 18 months, after a 6-month unsupported phase), however as in other

maintenance trials, weight re-gain started once the maintenance phase began (Coughlin et al., 2016 ; West et al., 2011; West et al., 2007). Put together, these data suggest that a) motivational support, such as MI, is needed and desired by individuals trying to lose weight and those who wish to maintain weight loss. and b) there is room for improving its clinical effectiveness, especially long-term, making it an important area for further development.

1.3 Scope for improving upon MI

One reason for MI's long-term clinical shortcomings, might be that participants are not typically taught, or encouraged to practise, how to apply MI strategies by themselves, outside the therapy setting. This could potentially reduce its effectiveness in real-life decision situations (Kavanagh, Andrade, May, & Connor, 2014; Olander et al., 2013) where clients might struggle with behavioural control. Often our best intentions to change are far removed from the immediate pressures of temptations in every day contexts. We are generally bad at forecasting the complexity, extent and duration of our emotions linked to future events (Wilson & Gilbert, 2000), and therefore, how difficult it will be to exert enough self-control to stay focused on our original goals (Sayette, Loewenstein, Griffin, & Black, 2009). For example, Sayette et al. (2009) showed that active smokers had problems imagining how bad their future cigarette cravings would be when they were in a non-craving, or low craving state ('cold' state), as opposed to when actively craving (hot state). Subsequently, they also underestimated the effect this might have on their judgement. Smokers in a cold state, who attended the first experimental session (out of two in total), consistently underestimated the amount of money (immediate and real payout) they would accept for delaying smoking in the second session, once a hot state had been induced. This underprediction of the magnitude of future cravings was not observed in the other experimental group. They were smoke deprived for 12 hours before session one, and therefore asked to make monetary predictions while in a hot state (Sayette et al., 2009).

Woodzicka and LaFrance (2001) asked women to predict how they might react to sexually harassing questions in a job-interview and later on compared their forecasts with women who had actually experienced such scenarios. The majority of the affective forecasting group of women predicted they would feel anger, not answer at least one of the questions (68%) and confront the interviewee (28%). In reality, the majority of women who had been subjected to actual interviews described experiencing fear, answered most of the questions and did not find the courage to confront the instigator. The women who made predictions, constructed a fairly straight forward situation that made confronting an attacker simple. They failed to represent the level of complexity of the real scenario, likely involving intimidation, confusion and fear (Woodzicka & LaFrance, 2001).

We think we have a good handle on predicting how we will feel in the future and we do not acknowledge that our predictions are based on construals, rather than objective truths. Because we fail to acknowledge that events may not unfold exactly how we thought they would, we cannot possibly forecast how we will feel (Wilson & Gilbert, 2000). During a MI session, individuals may underestimate how hard it will be to change. So, there should be some focus on helping people to mentally construct realistic future scenarios, helping them to become better at anticipating obstacles.

Another problem with behaviour change is that it is targeted at future goals. All else being equal, future rewards have less potency than immediate rewards (Hull, 1943). Discounting of delayed incentives, is a related cognitive phenomenon which often informs our decisions in everyday life (Bickel & Marsch, 2001). Delay discounting in essence, is the degree to which we choose, or prefer a smaller and immediate reward, when pitched against a larger, delayed reward (Mischel, Shoda, & Rodriguez, 1992). The ability to delay immediate gratification, for a more beneficial later reward, is mediated by individual differences, especially the amount of self-control an individual can exert in the face of immediate temptations (Mischel et al., 1992) and by how delayed and uncertain a later

reward is, for example better health (Epstein, Salvy, Carr, Dearing, & Bickel, 2010):

Refusing the chocolate cake and upsetting my colleague who bought it for me, versus potentially reducing my type 2 diabetes medication, due to better diet management.

Women with obesity showed greater delay discounting than women with healthy weight, when asked a series of questions about their preference for a smaller, but more immediate financial reward, versus a larger, but more delayed financial reward (Weller, Cook, Avsar, & Cox, 2008). Similar findings have been obtained with individuals with different drug dependence (Bickel & Marsch, 2001). A better motivational intervention might reduce delay discounting by increasing the incentive value of future goals.

We frequently experience desires and around 50% of the time they conflict with a personal goal (Hofmann, Baumeister, Förster, & Vohs, 2012; Hofmann, Vohs, & Baumeister, 2012). When we are given time to assess the future outcomes of a more functional behaviour, within a counselling setting, where our cognitive capacity is not tasked with intrusive desires (Kavanagh, Andrade, & May, 2005), we can easily acknowledge that the benefits of the functional behaviour, will most likely be greater. But, when we are facing an unexpected immediate temptation in everyday life these benefits cannot withstand the certain momentary satisfaction we could gain from having that cheeky milkshake, or chocolate cake. In real life, immediate temptations have a stronger pull than we anticipated and future rewards are discounted relative to those immediate ones, bringing back the ambivalence about which to choose that MI had tried to reduce.

The conflict between short-term temptations and more delayed functional goals can be explained in the light of construal-level processing (Trope & Liberman, 2010). Trope and Liberman (2003) distinguish between low level construals, which focus on subordinate, local features of a situation, and global higher level construals, which require abstracting of superordinate, global features; they are more holistically processed, lacking salient detail. So, when contemplating a future health goal for example, attention is on

higher level construals, but when faced with real-world temptations, attention is occupied by immediately available local low-level construals, less by global features of the original goal. The power of immediate rewards over more distant goals is not inevitable. Fujita, Trope, Liberman, and Levin-Sagi (2006) have shown that priming higher level construals, just before they were needed, boosted self-control across several experiments.

Participants who were asked WHY they might engage in a task showed more self-control than those asked HOW they would go about it (priming local, low-level construals).

Conversely, Kim, Schnall and White (2013) reduced delay discounting on a simulation of a lottery by encouraging low level construal of future rewards. Participants more often chose to wait for a delayed reward when it was described in detail as a holiday in Paris than when it was presented as the equivalent sum of money.

This research shows that decisions can be weighted towards future goals by encouraging high-level construals in general, or by encouraging low level construals of those future goals, making them easier to compare mentally with present rewards. Because people tend naturally to use low-level construals when making decisions about immediate rewards (e.g., to eat the cake rather than stick to the diet), we suggest that motivational interventions should help construe future goals at a lower level. MI does this by helping clients think in detail about their desired future and how to achieve it. A hypothetical weight-loss goal, for example, will be carefully contrasted with the client's current state, priming easily available negative lower level construals. When the client is then asked to discuss the benefits of change, especially those that might happen very soon (once they reduced calories for a week, for example), the resultant discrepancy draws attention to the global construals of the desired end goal (and the client's values). This will in theory, reduce ambivalence, build motivation to initiate actions to achieve it and make it more readily available. MI also tries to reduce the impact of lower-level construals, by getting the client to discuss potential immediate barriers to change and speaking of

strategies they might use to stay on track for their desired (delayed) end goal, aiming to prime global construals, over lower-level ones, for such situations.

Even though MI tries to accentuate the salience and affective impacts of functional outcomes, past successes and strategies for overcoming barriers, their retrieval in the natural environment is not a given. While attending a MI session, an individual will not typically find themselves surrounded by poorly forecasted temptations. Neither will they be engaged in a dysfunctional behaviour in pursuit of short-term gain, inconsistent with their long-term functional goals and values. This means that alternative outcomes of situations and behaviours can be assessed with relatively uncontaminated clarity, drawing attention to their differential value to the person (Kavanagh, Andrade, Solbrig, Conolley & May, 2018). When facing temptation outside of MI sessions, lower level- construal of the immediate event will typically dominate, not the future goal. In combination with a tendency for cravings to capture working memory resources (May, Andrade, Panabokke, & Kavanagh, 2010), this process can zap motivation and challenge efforts to stay in control, when individuals need to most (Kavanagh et al., 2018).

While MI fosters a consideration of participants' own values, motivations and abilities (Miller & Rollnick, 2012), it is still facilitated by a practitioner, educator or therapist. It does not directly equip individuals with behavioural tools they can apply by themselves. A proportion of MI participants may spontaneously infer key strategies from their experience of MI counselling and generalize the approach to new situations or goals, outside the clinical setting, but others may not (Kavanagh et al., 2018). Perhaps MI strategies should be made more transparent to participants, with the next step being an effort to teach participants to use these principles by themselves. However, because MI is dependent on dialogue, it is hard to see how it could be translated into a skill that people do for themselves.

MI's most critical limitation is perhaps that it is so heavily reliant on a verbal style of communication and encoding. It does not yet harness the latest cognitive developments on desire (Andrade, May, & Kavanagh, 2012; Kavanagh ; Andrade, May, Connor, 2014; Kavanagh, Andrade, & May, 2005; Kavanagh et al., 2014) and emotion (Blackwell et al., 2013; Holmes & Mathews, 2005; Renner, Ji, Pictet, Holmes, & Blackwell, 2017), which accentuate the critical role that episodic multi-sensory mental imagery has in motivation for behaviour change (Knäuper et al., 2011; Knäuper, Roseman, Johnson, & Krantz, 2009; Michie et al., 2011; Neill, Oluyomi, & Epstein, 2016; Parham et al., 2016).

Mental Imagery is the ability to experience for example, objects, people, activities and events, by creating a rich internal representation in our mind, using all our senses. Recent findings from neuroscience, suggest that visual mental imagery is a depictive internal representation that can be likened to a weak form of perception (Moulton & Kosslyn, 2009; Pearson, Naselaris, Holmes, & Kosslyn, 2015). It is fittingly referred to by Kosslyn, Ganis and Thompson (2001), as the experience of “seeing with the mind’s eye,” “hearing with the mind’s ear,” and so on.

The suggestion is not that mental imagery cannot be spontaneously and temporally experienced by individuals throughout a MI session, but it is not systematically and routinely elicited, potentially limiting MI's therapeutic impact. For example, imagining events in our personal future can reduce delay discounting for weight-loss goals (Daniel, Stanton, & Epstein, 2013) and support behaviour consistent with those goals. Neill, Oluyomi and Epstein (2016) prompted female participants with overweight, or obesity, to imagine a self-chosen specific future event ('episodic future thinking'), combined with achieving a health goal at the event, or noticing how good they will feel about having achieved said goal by the time the event occurred. These participants, who had a goal of improving their eating habits, consumed significantly fewer calories while having a complimentary lunch in a public food court, compared to a control. The control group were

prompted to generate imagery of an event they had experienced in the past 24 hours, in combination with a habit, or routine they do regularly and enjoy (Neill et al., 2016). If we emulated future goal achievement explicitly in MI, using mental imagery, we might help participants retain their desire for that goal when faced with immediate temptation (Kavanagh et al., 2018).

One key reason why imagery impacts motivation is the close link between imagery and emotion. Substantial evidence now shows that affective responses are more closely linked with imagery than with verbal representations (Holmes & Mathews, 2010). In a classic study Holmes & Mathews (2005), found mental imagery while considering positive and negative situations, elicited higher levels of emotions, compared to verbal elaboration of the same scenarios. Image vividness is strongly and positively correlated with emotionality (Bywaters, Andrade & Turpin, 2004). Blocking imagery reduces the emotional intensity of memories and reducing vividness, reduces emotion in recollection of traumatic memories (Andrade, Kavanagh, & Baddeley, 1997; Lilley, Andrade, Turpin, Sabin-Farrell, & Holmes, 2009). These findings are consistent with a view of imagery as an embodied cognition (Barsalou, 2008) involving physiological and motor responses as well as sensory processes comparable with those operating during perception (Pearson, Clifford, & Tong, 2008). Mental images might therefore provide a vivid, multisensory emulation of real-life experiences that can ready us for congruent action (Moulton & Kosslyn, 2009). Using brain imaging, Kosslyn et al. (2001), showed for example that neural representations of mental and actual perceptual images likened one another as early as the primary visual cortex (V1). Moulton and Kosslyn (2009), go so far as to argue that the primary function of mental imagery is to answer 'What if?' questions of the future, via the retrieval of past experiences and the generation of prediction based on those. This process, Moulton and Kosslyn (2009) suggest, highlights the likely consequences of being in a specific situation, or engaging in a certain behaviour and making them more salient and available. Given how

poor we are at affective forecasting (Wilson & Gilbert, 2000) and delay discounting (Bickel & Marsch, 2001), practising targeted imagery emulations of possible future behaviour change scenarios in MI, might enhance our accuracy of predicting how we will feel, especially if we are able to draw on past experiences. This process could aid us in situations where we suspect we might face barriers and help us to prepare to overcome them based on strategies we know have worked in the past.

An additional implication concerns MI's aim of building affect to enhance the perceived importance of functional goals. This is achieved by drawing the client's attention to inconsistencies between their personal goals, values and consequences of, or fear of consequences of, current dysfunctional behaviours, including the anticipatory satisfaction from outcomes of more functional behaviour (Miller & Rollnick, 2012). As part of this process, people are also asked to recall past times where they have succeeded at achieving a goal (or even partial successes). Recalling success not only reminds them of their capability to achieve a desired goal (building self-efficacy), it also elicits positive affect. These positive emotions can help to re-enforce the person's sense that they can apply effort, to retrieve more such past success because a positive emotional state will make mood-congruent thoughts more available for retrieval (Kavanagh & Bower, 1985). Recreating salient past successes, using imagery, should amplify their positive impact on mood, hence, MI's effectiveness should be boosted if it routinely elicited such imagery.

Lastly, the use of imagery in MI could further amplify self-efficacy for behaviour change (Miller & Rollnick, 2012). The phenomenon of imagination-inflation has been well documented; it is the process by which imagining a counterfactual event can increase confidence that it actually happened (Garry, Manning, Loftus, & Sherman, 1996). Imagery also raises confidence that events may happen in the future (Gregory, Cialdini, & Carpenter, 1982). (Gregory et al., 1982) for example, found participants who read, or listened to structured imagery scenarios (both negative, e.g. being arrested for an armed-

robbery and positive, e.g. taking part in a prize draw while shopping with friends and winning a trip to Hawaii) were more likely to believe these events might in fact happen to them in the future. Additionally, participants behaviour was also affected; homeowners who imagined a structured scenario about using a cable TV service, were more likely to subscribe to one a few weeks later, upon it being offered to them (Gregory et al., 1982). This has important implications. In MI, once individuals transition from speaking of hypothetical change, to committing to change, a behavioural action-plan for getting started with their goal is worked out collaboratively. Imagining carrying out this plan will increase the likelihood that it is converted from intentions into action. Knäuper et al., (2009) found that imagery improved the impact of making an implementation intention to collect a five US dollar reward and to make healthy additions to one's diet (Knäuper et al., 2011). In Knäuper et al., (2009) student participants in one condition were asked to form an implementation intention to collect \$5 reward from the on-campus psychology laboratory. The other group was additionally instructed to vividly imagine their plan's steps. Nearly half (40%) of participants failed to pick up the \$5 in the implementation intention condition, compared to only 12% who failed to obtain it in the imagery implementation intention condition (Knäuper et al., 2009).

This research base suggests a potential of applying mental imagery in motivational interventions for behaviour change, but it has not been applied to MI yet. The challenge was to develop a motivational intervention that incorporated mental imagery while retaining the well-evidenced benefits of MI. Kavanagh, Andrade and May addressed this challenge over the past 15 years by developing Functional Imagery Training (FIT; Andrade, Khalil, Dickson, May, & Kavanagh, 2016; Kavanagh et al., 2018)². FIT in essence is imagery-based MI, with a strong additional focus on training self-motivation.

² FIT was originally called Functional Decision Making (in Andrade, May, et al., 2012 and in May, Andrade, Kavanagh, & Hetherington, 2012)

Over the past three years I have been adapting FIT to and testing it in the context of weight management. FIT was designed as a general behaviour change intervention that had already shown promise for alcohol reduction across two uncontrolled pilot trials up to six months in Australia (Kavanagh et al., 2018). In the UK, preliminary data had been collected on two important elements of weight management, namely snacking on high calorie foods and sweetened drinks (Andrade et al., 2016), and physical activity (Andrade, Lennox, Kavanagh & May, 2012). Andrade et al. (2016) showed that half an hour of FIT reduced snacking over two weeks relative to advice alone, within a stepped-wedge design (Craig et al., 2008). In this design, the intervention was rolled out over time in two different groups. The immediate FIT group received FIT in their first session (after baseline measurements) and the delayed FIT group received FIT in their second session (their first session comprised baseline measures, followed by brief advice and information) after a 2-week delay. Both groups were followed up after 4 weeks. Results showed an increase in the frequency of motivational thoughts about cutting down on snacks, a decrease in the number of snacking occasions, and a reduction in consumption of snacks. The decrease in snacking occurred over the 2 weeks, immediately following the FIT session, and, for the group who received it at the baseline meeting, persisted for 4 weeks. In Andrade, Lennox and Kavanagh (2012), 30-45 minutes of FIT increased exercise frequency and duration of sessions in gym members who wished to get more out of their gym membership over 2 weeks, compared with gym membership and self-monitoring alone. These data motivated a natural progression to extend FIT's focus from just one or two specific behaviours (reducing snacking, increasing gym activity) to numerous self-set goals, addressing healthy eating and physical activity, and to test FIT's potential to support long-lasting behaviour change.

1.4 Functional Imagery Training: A translation of the Elaborated Intrusion Theory of Desire

Often behaviour change strategies tend to scaffold motivation through for example goal-setting and monitoring, reminders and feedback, whereas FIT aims directly to strengthen desire for behaviour change and self-efficacy for achieving it. FIT is based on the EI theory (Kavanagh et al., 2005) which offers a new way of incorporating the role of desire in boosting motivation for initiating and sustaining behaviour change.

According to EI theory, multisensory imagery is a central component of desires, especially when they are intense (May, Kavanagh, & Andrade, 2014). A craving, or desire, typically begins as a seemingly spontaneous intrusive thought (May, Andrade, Panabokke, & Kavanagh 2004), either triggered externally by the environment, or internally, by for example negative emotional states, such as boredom, or a physiological deficit like hunger (Kavanagh et al., 2005). These initial thoughts can be fleeting, but when the deficit they highlight is perceived as strong, or salient enough, desire cognitions permeate into attention, where they are consciously elaborated. Key to this thought elaboration is multi-sensory mental imagery of attainment and consumption of the craved substance and the immediate reward or pleasure of that consumption (May et al., 2014). In May et al. (2004), 65% of participants 'imagined the smell/taste', and 59% 'pictured myself having it' when describing a craving. Mental imagery also predicts craving strength (May, Andrade, Kavanagh, & Penfound, 2008), which predicts subsequent consumption (Boswell & Kober, 2016; Connor et al., 2014; May et al., 2014). This imagined attainment and consumption is pleasurable at first which is why we do it. If the craving cannot be satisfied, the accompanying imagery provides a vivid comparison between our current state and the desired state, highlighting the discrepancy and making us increasingly aware of it. In this case, the craving becomes aversive (Kavanagh et al., 2005).

According to EI theory, functional desires should operate in a similar way to unwanted cravings. This hypothesis is supported by findings that imagery not only features

in cravings for substances like alcohol or chocolate (Kavanagh, Andrade, & May, 2004; May et al., 2014), but it is also present in desires for healthy goals, such as physical activity (May et al., 2008;), alcohol reduction (Robinson, Kavanagh, Connor, May & Andrade, 2016), diabetes self-management (Parham et al., 2016), and pro-environmental behaviours (Boomsma, Pahl, & Andrade, 2016). Practising and strengthening imagery is therefore predicted to increase motivation and there is good evidence to support this prediction in relation to motivation for physical activity (Giacobbi, Dreisbach, Thurlow, Anand, & Garcia, 2014). Giacobbi et al. (2014), for example, randomised inactive, female university students with overweight, or obesity to either one of two conditions over a 10-week time frame: 1) A peer mentored programme (3 sessions), encouraging 150 minutes of moderate to vigorous physical activity a week, self-monitoring (exercise journal, web and paper based) and SMART goal setting (specific, measurable, action-oriented (behavioural), realistic, and timed). The concluding part of mentor-meetings consisted of participants engaging in cardio-vascular exercises of their choice, alongside mentors. 2) The same peer mentored programme with the addition of guided mental imagery during sessions and on a website that also provided an e-version of the exercise journal/log. Mentors defined mental imagery, offered examples of how to use this skill, and introduced a theoretically-based mental imagery script, focusing on imagining performing a cardiovascular exercise. Five specific imagery scenarios followed: 1) imagining a place to exercise; 2) a slow-paced warm-up (of the participants' choice); 3) images of a progressively more intense exercise; 4) coping with a vigorous activity; and 5) encouraging participants to monitor exercise technique. They found that both conditions significantly improved cardio-respiratory endurance, ratings of perceived endurance, and importantly self-determined motivation to exercise. But, increases in self-determined motivation to exercise, in the peer mentored plus mental imagery condition were significantly greater at follow-up, compared to peer-mentoring alone (Giacobbi et al., 2014).

In EI theory, mental imagery supports motivation by emulating the immediately satisfying feeling of achieving one's goals. This positive emotion is key because it feeds into a cognitive cycle of imagining the goal and gaining temporary reward, but at the same time enhancing awareness of the contrast between the desired state and one's current state, including inconsistencies with personal values (Kavanagh et al., 2005). The negative affect elicited by this mental contrast motivates behaviour to reduce it (Oettingen & Gollwitzer, 2010).

Imagery is supported by limited-capacity working memory systems (Baddeley & Andrade, 2000). The habitual elicitation and practice of positive mental imagery for healthy goals should therefore weaken cravings by interfering with imagery for conflicting rewards (craving imagery), as has been demonstrated with other types of imagery (Kemps & Tiggemann, 2007, 2015; Schumacher, Kemps & Tiggemann, 2017; May, Andrade, Panabokke, & Kavanagh, 2010). Goal imagery should boost the belief that the goal is attainable; research shows that imagined events are rated as more likely to happen, or to have happened (Carroll, 1978; Mazzoni & Memon, 2003). Goal imagery should also increase the likelihood that plans for working on the goal are converted into actions (Knäuper et al., 2011, 2009).

Imagery of technique or performance success has been widely used in sport and exercise research and practice (Cumming & Williams, 2012; Weinberg, 2008). An important difference, and principle, in FIT is that the content of imagery should be personal to the participant. Therefore, FIT is delivered in the empathic, collaborative style of MI (Miller & Rollnick, 2012), trusting participants to be an expert on themselves, and assisting them to identify and consider their own goals and related behaviours rather than trying to convince them to adopt a pre-set regimen. FIT also covers similar topic areas to MI (Miller & Rollnick, 2012), eliciting the person's incentives for change, exploring discrepancies between core values and current behaviour, boosting self-efficacy and (in people

committed to change) developing specific action plans for implementation of this commitment. However, at each step, it also invites participants to develop personalised multisensory imagery to maximize the veridicality and emotional impact of each aspect, so that each key step is explored via the individual's own imagination (Andrade et al., 2016). Because imagery is more emotive than other types of thought (Blackwell et al., 2013; Holmes & Mathews, 2005; Ji, Holmes, & Blackwell, 2017), it should create stronger goal commitment and pursuit.

Motivation for health promoting and pro-social behaviours has been successfully increased when individuals imagined themselves in such situations (Crisp, Meleady, Stathi, & Turner, 2010; Rennie, Adams, Uskul, & Appleton, 2014). Longin, Grasse, Aspalter, & Waldherr 2012, for example found that intentions to help a person, when individuals were presented with a scenario of another person in need, were increased, while participants imagined either an episodic past scenario of helping someone, or imagined helping the person described in the experimental task. They further provided evidence that higher intentions to help were not an emotional by-product of perspective taking, but appeared to be linked with the vividness of episodic imagery (Longin et al., 2012).

FIT uses short interview sessions and regular booster calls to build and support desire for specific, achievable, self-set goals and sub-goals (Andrade et al., 2016). The latter is particularly important because imagery can also demotivate and discourage ongoing goal pursuit, if the end goal is mentally detached from a clear path for achieving it (Oettingen, Mayer, & Thorpe, 2010).

Once participants are committed to change, FIT transitions into training them to become their own FIT therapist, supporting their autonomy and ability to flexibly respond to self-management challenges in the natural environment, using imagery. FIT instructs individuals to practice imagery outside the interview sessions, paired alongside a frequent

behaviour, such as making a cup of tea, or in response to cues from a mobile phone, to develop a cognitive habit of practising emotive goal-related multisensory imagery and deliberately eliciting imagery whenever motivation needs to be strengthened or renewed. Specifically, participants are trained to generate imagery of the most immediate positive changes they will experience from working towards their healthy goals, such as how good their body will feel after exercising today, making them readily and vividly available, so they come to mind easily when faced with temptations (Andrade et al., 2016). This routinely self-generated functional imagery will additionally interfere with cravings when unexpected temptations arise (May et al., 2010).

As part of their goal-orientated and success imagery, individuals also habitually imagine the specific actions they will take to achieve sub-goals, practise overcoming barriers to working on their goals and identify and imagine using strategies that have worked for them in the past (Andrade et al., 2016). The desired end goal now becomes more proximal (Trope & Liberman, 2010) and within reach, via clear realisable steps. This is because imagined scenarios allow for a real life emulation of a clear path to achieving a desired outcome (Kavanagh et al., 2005; Moulton & Kosslyn, 2009). Vividly imagining one's past successes, even partial ones, previously helpful ideas and overcoming barriers should boost self-efficacy beliefs, a vital cognitive component for sustained behaviour change (Bandura, 1989; Bandura, 1977; Michie et al., 2011; Miller & Rollnick, 2012; Ryan et al., 2008; Stich, Knäuper, & Tint, 2009) that an attempt to engage in the new behaviour will be successful (Andrade, May, & Kavanagh, 2012; Kavanagh et al., 2014; May et al., 2014). Detailed episodic imagery that is firmly grounded in experience allows them to anticipate problematic situations, and plan and rehearse effective responses to them beforehand ('symbolic practice'; Bandura, 1982).

1.5 Aims

In line with the MRC guidelines on the development of complex interventions (Craig et al., 2008), informed by a recent systematic review of MI interventions for weight-loss (Armstrong et al., 2011), this research answered some feasibility questions, completed a pilot stage and established proof of concept/efficacy of FIT as novel complex, theory-based intervention for weight-management within a traditional parallel group RCT. The aims and objectives were:

1. To explore amongst 25 adults who at the time were trying to lose weight, or maintaining weight loss, (i) problems, experiences and wishes, in regards to weight management and weight loss support, including e-health support; (ii) reactions to Functional Imagery training as a possible intervention and (iii) to assess whether they struggle with motivation in the same way experimental samples and clinical sample had reported. We invited participants, from a public pool of people who had expressed an interest in helping with research to attend focus group discussions that were be transcribed and thematically analysed.
2. To test the impact on and acceptability of FIT for weight loss. Twenty-four participants were recruited from a volunteer panel, with a BMI of 25 kg/m². They were allocated to an uncontrolled pilot trial, with a 3-month FIT-supported active phase and a 12-month unsupported maintenance phase. The main outcome measures were weight (kg) and waist circumference (cm) reductions at 3 and 15 months.
3. To test the efficacy of FIT, compared with MI (time and contact-matched), for achieving and sustaining weight-loss in adults from the general public with overweight, or obesity. We recruited 141 adults with BMI (kg/m²) \geq 25, via a community newspaper article, to a single-centre randomised controlled trial (RCT). Participants were allocated to one of two active interventions: FIT or MI. Primary data collection and analyses were conducted by researchers blind to interventions. All participants received two sessions of their allocated intervention; the first face-to-face, the second

by phone. Booster calls were provided every 2 weeks for 3 months, then once-monthly until 6 months. Participants were assessed at baseline, at the end of the intervention phase (6 months), and again 12 months post-baseline. The main outcome measures were weight (kg) and waist circumference (cm) reductions at 6 and 12 months.

4. To experimentally identify some of the active ingredients FIT and MI are designed to address, such as motivation, desire and self-efficacy. We compared the impact of FIT with MI on motivation/desire and self-efficacy, as part of the randomised controlled trial for weight loss. Participants completed the Motivational Thought Frequency Scale (MTF), Weight Efficacy Lifestyle Questionnaire (WEL) and Spinal Court Injury Exercise Self-Efficacy Scale (SCI ESES) before randomisation and one month later, after receiving two sessions of MI or FIT and a booster call.
5. To collect qualitative data to improve FIT further, to deliver a qualitative comparison of the experience of motivational interventions, MI and FIT, as well as exploring the need for additional support. To capture and compare the range of experiences amongst MI and FIT participants, an anonymous questionnaire was filled in online and thematically analysed. Open-ended questions covered a range of experiences from comparing previous to current weight loss attempts, improvements outside of weight-loss and best and worst aspects of the interventions.

1.6 Thesis outline

Chapter 2 describes study 1: ‘People trying to lose weight dislike calorie counting apps and want motivational support to help them achieve their goals.’ This study was a qualitative thematic exploration of problems and wishes in regards to weight-management, including reactions to Functional Imagery Training (FIT) as a possible intervention. Results were presented at the School of Psychology conference, 2015, Plymouth University, England, as a poster: ‘Exploring Barriers to Weight Loss and Potential Solutions’, and at the British Association for Behavioural and Cognitive

Psychotherapies (BABCP) Conference, Belfast, 2016, as part of a talk: 'Functional Imagery Training for motivating weight loss and increasing physical activity'. The results of this chapter were also published: Solbrig, L., Jones, R., Kavanagh, D., May, J., Parkin, T. & Andrade, J. (2017). People trying to lose weight dislike calorie counting apps and want motivational support to help them achieve their goals. *Internet Interventions*, 7, 23-31.

Chapter 3 describes study 2: 'Functional Imagery Training for weight loss and weight loss maintenance: A 15-month pilot study.' This chapter reports a test of the impact of FIT on weight-loss and waist-line reductions over a three-month FIT-supported active phase and a 12-month unsupported maintenance phase. The results of this study have been presented as part of several talks: 1) At BABCP Conference, Belfast, 2016: 'Functional Imagery Training for motivating weight loss and increasing physical activity'; 2) at 'The Plymouth Cognition Institute Conference', Plymouth, England, 2016 and 3) at 'The International Convention of Psychological Science', Vienna, March 2017: 'Functional Imagery Training for motivating weight loss and weight loss maintenance' and at 'BABCP Conference', Manchester, 2017.

Chapter 4 is the overview of methods for chapter 5 (study 3) and 6 (study 4).

Chapter 5 describes study 3: 'Functional imagery training versus motivational interviewing: Effects on motivation and self- efficacy to eat healthily and increase physical activity.' This chapter investigates the impact of FIT, compared to MI, on motivation and self-efficacy, over the first month of the weight-loss RCT (chapter 6) in overweight and obese community volunteers. Results have been presented in a talk at the International Convention of Psychological Science, Vienna, March 2017: 'Functional Imagery Training for motivating weight loss and weight loss maintenance'. Results are also to be submitted in August 2018: Solbrig, L., Khalil, M., Kavanagh, D., May, J. & Andrade, J. (2018). Functional Imagery Training and Motivational Interviewing: A Qualitative

Investigation of Motivational Interventions for Weight-loss. *(for submission to Health Psychology end of August 2018)*

Chapter 6 describes study 4: ‘Functional Imagery Training versus Motivational Interviewing for Weight Loss: A randomised controlled trial of brief individual interventions for overweight and obesity.’ This study is the RCT for weight-loss, comparing FIT and MI over an intervention-supported six-month period, followed by six months unsupported, within a linear mixed-models approach. In line with MRC guidelines (Craig et al., 2008) the RCT results are presented in the context of a systematic review of similar interventions (MI interventions for weight-loss, Armstrong et al. (2011)). Some of the results were presented as a talk at the BABCP Conference, Manchester, 2017: ‘Functional Imagery Training versus Motivational Interviewing for weight-loss’ and I was awarded the 2017 BABCP ‘Best Newcomer Excellence Award’ for this piece of research. The results are in press at the International Journal of Obesity: Solbrig, L., Whalley, B., Kavanagh, D., May, J., Parkin, T., Jones, R. & Andrade, J. (2018). Functional Imagery Training versus Motivational Interviewing for weight loss: A randomised controlled trial. *International Journal of Obesity*.

Chapter 7 describes study 5: ‘Functional Imagery Training and Motivational Interviewing: A Qualitative Investigation of Motivational Interventions for Weight-loss.’ This chapter qualitatively explores experiences of MI and FIT RCT participants, upon completing the six-month intervention-phase. The results are in preparation to be submitted to *The International Journal of Obesity* at the end of August 2018: Solbrig, L., Khalil, M., Kavanagh, D., May, J. & Andrade, J. (2018). Functional Imagery Training and Motivational Interviewing: A Qualitative Investigation of Motivational Interventions for Weight-loss. *(for submission end of August 2018)*

Chapter 8 is the general discussion. We suggest that future research should test the effectiveness of FIT for weight management in healthcare settings and its efficacy for

tackling other health problems where behaviour forms a component (e.g., addiction and anxiety).

Chapter 2: People trying to lose weight dislike calorie counting apps and want motivational support to help them achieve their goals

Study 1 was intended as a qualitative exploration of people's experiences and wishes in relation to weight loss. The aim was to determine if motivation was a key issue for people with overweight or obesity who wanted to lose weight, and to find out what they had tried before, what potential they saw for app-based support, and what they thought of FIT when it was briefly described to them. The paper that is the basis of this chapter highlighted the eHealth aspects of the study, to fit the remit of the target journal.

2.1. Background

Rising obesity levels put half the UK's adult population at risk of developing serious morbidities, such as Type 2 diabetes, cancers and various heart conditions (Eastwood, 2013). The array of interventions spans educational methods, behavioural interventions, drug treatments and bariatric surgery. Bariatric surgery, drug treatments and very low-calorie diets pose the risk of life threatening side effects and patients typically do not reach their desired weight (Encinosa et al. 2005; Encinosa et al., 2013; Picot et al., 2009). Clinical and commercial weight loss programs are not optimal either, producing short-term weight loss, but a typical long-term weight regain of about 40% (Bessesen, 2006). Most people who seek to lose weight, however, receive no professional support; 90% of overweight or obese patients have no weight management interventions recorded. Those who do receive support in the primary care setting generally get lifestyle and diet advice only (Booth, Prevost, & Gulliford, 2015; Laws, 2004).

General practitioners (GPs) are keen to help obese patients lose weight but feel they lack time to offer extensive help (Ruelaz et al., 2007). Patients too feel that doctors would not have sufficient time to help them (Levine, Savarimuthu, Squires, Nicholson, & Jay, 2014; Tan, Zwar, Dennis, & Vagholkar, 2005). There is some mismatch between GPs' and patients' perceptions of the problems. In Ruelaz et al's (2007) study, GPs thought that

patients lack self-control and are helplessly exposed to an obesogenic environment and in a recent systematic-review, Levine et al. (2014) report 'provider-barriers' including limited consultation time, lack of training and poor competency amongst primary care staff when dealing with obese individuals. Patients on the other hand felt there was a place for GPs pointing them into the right direction, by providing useful information on nutrition and exercise, but that long-term weight management was their own responsibility and they wished to manage it themselves (Ruelaz et al., 2007). These discrepancies offer opportunities for improving weight management services to address patients' needs within the existing constraints on healthcare provision.

Web-based and mobile applications (apps) that provide diet and physical activity support are readily available and many are free of charge (Breton, Fuemmeler, & Abrams, 2011). They are increasingly popular as a tool for weight management (Azar et al., 2013) and are accessible to the 70% of the UK population who are smart-phone users (Deloitte, 2014 figures for all ages and trend rising). These apps could help GPs save time during consultations, save costs and enable people with obesity and overweight to work autonomously on weight control in their own time. Outside of general practice, effective online support also has the potential to reach a wider audience who might benefit from help with weight-management. Improved support is needed because self-management has provided only modest results so far, compared to commercial weight loss programmes (Heshka et al., 2003).

Publicly available weight management apps typically offer calorie and step counting and limited amounts of self-monitoring and goal-setting (Turner-McGrievy et al., 2013). Using the MARS rating scale, a new tool for trialling, classifying, and rating the quality of mobile health apps (Stoyanov et al., 2015), Bardus et al. (2016) found that the 23 most popular weight loss apps on Google Play and iTunes in 2015 incorporated most commonly self-monitoring and goal-setting, but also semi-automated tracking, app communities,

social media sharing and notifications. Apps with the most behaviour change techniques and user-friendliest design were rated highest in quality by two independent coders (Bardus, van Beurden, Smith, & Abraham, 2016; Tang, Abraham, Stamp, & Greaves, 2015).

This research suggests scope for adding additional behaviour change elements to apps. Evidence on the importance of sustaining motivation for weight loss suggests that automated motivational support is an important target for development, for example apps could include stress reduction or problem solving tools to support motivation during difficult periods (Pagoto, Schneider, Jojic, Debiasse, & Mann, 2013; Webber, Tate, Ward, & Bowling, 2010). Motivation is a good predictor of long-term weight loss (Elfhag et al., 2005; Silva et al., 2011; Teixeira et al., 2004) and weight loss trials show benefits of motivational support delivered face-to-face (Armstrong et al., 2011) or remotely (Fjeldsoe, Marshall, & Miller, 2009; Patrick et al., 2009). For example, Jackson and colleagues (Jackson et al., 2011) found benefits for weight loss of online motivational interviewing in their Video Doctor trials. In Jackson et al.'s (2011) study, patients accessed the Video Doctor in GP surgeries. The majority of people who are trying to lose weight will not have accessed GP services and will be attempting to manage their weight autonomously. While there is scope for developing mobile motivational support, it will only be accessed if people want help with sustaining motivation.

Often motivational support is provided only at the start of a weight loss attempt, as in the Video Doctor trials (Jackson et al., 2011). Motivation is one of the commonly reported barriers to weight loss among treatment-seeking overweight and obese adults, along with stress, depression, food cravings (Sharifi et al., 2013), lack of knowledge, lack of control, and lack of time (Welsh et al., 2013). Less is known about the need for ongoing support among those who have already begun losing weight and wish to maintain or further reduce their weight. Previous studies have reported lack of 'willpower', or waning

motivation, as potential issues in weight regain; these data come from sub-group analyses of participants already enrolled in weight-loss trials (Metzgar et al., 2014; Sabinsky, Toft, Raben, & Holm, 2007), and a descriptive study of a sample representative of individuals looking for weight loss treatment in research settings (Burke, Steenkiste, Music, & Styn, 2008). There is a need to explore what might affect people's motivation over time, focusing on individuals typical of the majority who try to manage weight autonomously, and what support could be helpful.

FIT, described in chapter 1, aims to strengthen motivation through development of emotionally charged mental imagery during therapy sessions and it aims to maintain motivation by training individuals to practise imagery of goal-related behaviours routinely, and particularly when setting new goals. This imagery practice should help images of goal-achievement in the immediate future come to mind readily and vividly, particularly when faced with temptations, thereby boosting motivation and weakening cravings (Kavanagh et al., 2005; May et al., 2010). Ultimately, this imagery should become a cognitive habit, but until that point, mobile apps can help keep individuals on track. An app ('Goal in Mind'), (<https://itunes.apple.com/au/app/goal-in-mind/id1289557359?mt=8>; <https://play.google.com/store/apps/details?id=com.goalinmind&hl=en>)

was being developed to support FIT by allowing individuals to record new sub-goals, track their imagery practice, and view their progress. Users can upload their own photos and select a photo to focus on while listening to a guided imagery practice session.

The current study explored people's experiences of trying to maintain motivation during weight loss attempts and the motivational support they would like for the future. The population chosen were people who were not enrolled in a commercial program or research trial at the time of the discussions but were either thinking about losing weight, trying to lose weight, or maintaining weight loss on their own. Focus group interviews covered experiences of weight management, barriers to success, and desire for support

and particularly mobile support. After exploring these issues in general, the researcher described FIT briefly and showed screenshots from the FIT app to elicit views specifically on FIT as a form of motivational support. The study thus provided a first step in testing whether FIT might be acceptable to participants and whether accessing FIT support materials remotely through an app would be deemed useful.

2.2. Method

Ethical approval for this study was granted by the faculty research ethics committee of the Faculty of Health and Human Sciences, Plymouth University, March 23rd, 2015

Participants

Participants were recruited from a pool of volunteers from the general public who responded to an advert seeking those who wanted to lose weight or maintain previous weight loss. The 24 (6 males and 19 females, mean age = 30, age range= 19-70) who responded received £12 for taking part.

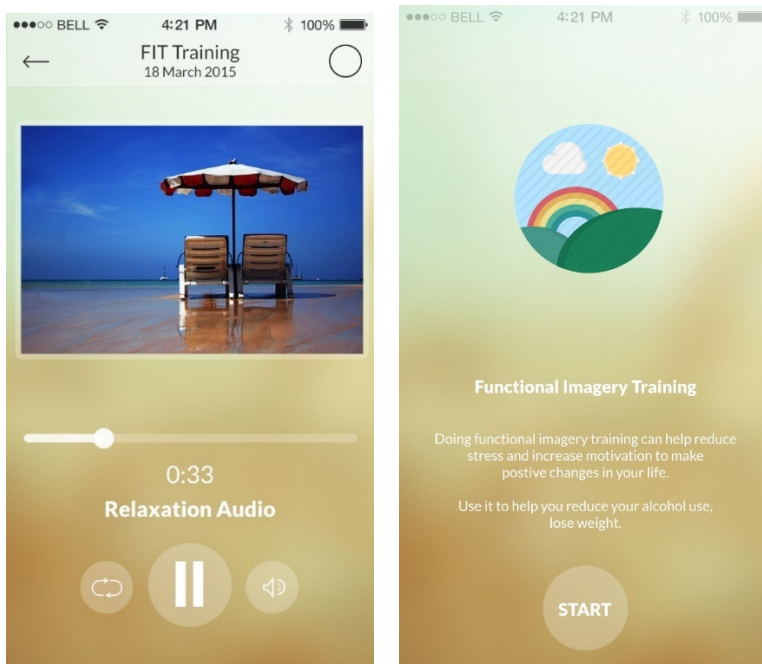
Procedure

Six focus group discussions (group sizes of three- seven participants) were facilitated and audio recorded by the primary researcher (LS) in a comfortable lab on the Plymouth University campus.

After welcoming participants, obtaining consent, and beginning audio recording, participants were encouraged to discuss any questions and points of interest that might arise from the group discussions amongst themselves rather than addressing the facilitator. The following questions were used to start the discussion: “Have you tried to control your weight before? Or are you trying to diet at the moment?” and 2) “What do/did you find the hardest part?”. If conversations did not spontaneously reach this point, groups were asked what sort of support would help them and, if they mentioned apps, what sort of app they would like.

Towards the end of all group discussions, the facilitator briefly explained the concept of FIT as being an intervention where individuals are trained to generate and practice mental imagery of how and why they will achieve their goals, and introduced three screen shot example slides of the FIT app under development (see below):

Figure 2. Goal in Mind app screen shots (under development)



Transcript analysis

Audio recordings were transcribed by the primary researcher as the first step to becoming immersed in the data (Bird, 2005). Transcripts were then checked against the audio files. The transcript analysis was guided by a 6-step theoretical thematic analysis outlined by Braun and Clarke (Braun & Clarke, 2006). Even though the researcher had some idea of what participants in weight loss trials had reported struggling with, there was no existing literature on individuals outside of studies that could have informed deductive coding. Therefore, an inductive approach was taken following Braun and Clarke (2006). The emerging themes informed by this dataset focused on participants' views on experiences of weight loss, obstacles, and support needs, as well as their views of FIT (Braun & Clarke, 2006). This inductive process consisted of the following steps: 1)

transcribing data, reading repeatedly and noting down initial ideas; 2) coding as many themes as possible, systematically, across the entire data set; 3) searching for and ordering codes into potential themes; 4) checking and reviewing themes against their coded extracts and the complete data set; 5) developing clear definitions and names for each theme, while refining and defining subthemes and the overall narrative the data analysis provides; 6) final review of data analysis and data write-up.

To ease the coding and sorting of emerging themes and subthemes the primary researcher used several colour codes, stickers and shapes on a printed version of the original transcript, for the entire set of responses from all 6 the focus groups. A second researcher (JA) peer-reviewed the initial set of themes and subthemes. After agreeing the final set of themes, she then sampled the transcript and checked allocation of excerpts to subthemes. Discrepancies were resolved through discussion until agreement was reached.

2.3. Results

Eight main themes emerged from the transcripts, comprising 31 subthemes (see Table 1). The themes clustered into four categories: motivation, previous experiences with weight loss programmes and self-help, desired changes for support, and comments on FIT (Table 1). The following section illustrates these results using participant quotations, accompanied by a participant identification number. The duration of focus group interviews ranged from 60-90min, with an average of 65 minutes.

Table 1. Major categories, themes and sub-themes reported by participants:

Categories	Themes	Sub-themes
Motivation	Initial Motivation	Health and looks

	Staying motivated	<p>Social Support</p> <p>Good weather</p> <p>Attention on physique</p> <p>Using pictures</p> <p>Goal setting</p>
	Barriers	<p>Inability to stay motivated</p> <p>Time and tiredness</p> <p>Slow results</p> <p>Limited knowledge and conflicting knowledge of nutrition</p> <p>No control over cravings</p> <p>Unwanted social influences</p>
<hr/>		
Previous experiences with weight loss programmes and self-help	Advantages	<p>Peer Support</p> <p>Apps provide 24/7 mobile access</p>
	Limitations	<p>Dislike of calorie counting</p> <p>Apps are too complex</p> <p>No personalisation and not relevant to user</p>

		No long term support
Desired changes for support	App support	App features wish list
	Motivational features	Setting/reviewing goals
		Routine
		Not too many alarms
		Personalisation
		Having control
		Rewards
		Progress reports
		Competition
		Sharing
Comments on FIT	Acceptability	FIT's potential
		Gender difference
		I would imagine...

2.3.1 Motivation

Initial motivation

When asked if they were trying to manage their weight at present, participants across all groups predominantly mentioned they were motivated to lose weight, or to exercise, to become healthy and more attractive.

5A: *'Well I suppose... I am trying to lose weight for various reasons really...there is probably a bit of vanity involved. Cos I want to look better, who doesn't...it's become increasingly more about health, not just the way I look.'*

Staying Motivated

Many participants described methods that helped them stay motivated.

Some found **Social Support** helpful:

1C: *'When I am back at home... my mother, she has turned into this kind of health fitness freak... She is my motivator. And I find when I am back in St. Albans I do more, I do a lot more exercise because she is there.'*

Mentions of social support consistently sparked discussion about following friends' fitness activities'. About half the participants said they found this inspired them:

3C: *'I look at like Instagram and Facebook and my friends are busy posting their activities and sometimes it's actually almost like: If they can run a half marathon maybe I can go to the gym?...I don't know if I want to share my own progress all the time, but I look to others for inspiration.'*

Four participants reported that **good weather** had a positive effect on their motivation. One participant said:

1C: *'Yeah. Nice weather. The weather is a massive key factor.'*

Another participant suggested that hotter climates might focus **attention on physique**:

4B : *'...Last time when I was in Australia the body image... seems so much more important over there...here it's very easy to cover up isn't it? And I think that perpetuates the fact that: I will just cover those wobbly bits and no one will see them...'*

Across all groups several participants found motivation by looking at **pictures** of themselves and others:

2C: *'It's so funny, in our flat we are all girls and we have currently printed off pictures of bikinis and we put our heads on it, so this is what we could look like*

and we put it on the fridge to remind us of eating well and going to spinning or whatever, so we look and feel good.'

Participants frequently talked about using **goal setting** as a strategy for motivation.

One participant mentioned:

3C: *'...like when you have a goal you do push harder to get there like. If I am like at 1000 steps I think: I want to do more and I even start walking around the house more in the day and break up periods of like sitting.'*

Barriers

Without exception groups spontaneously raised the issue of **motivation** when it came to weight management and admitted this was the biggest barrier to sustaining changes in diet and physical activity. Some described the issue as follows:

4C: *'... I am really bad with sticking at things. That's why I can't diet. I can't actually stick to a diet.'*

6F: *'...It's quite easy to lose the first bit of weight, but when you get past that it becomes difficult...'*

2C: *'It's motivation isn't it? I find it easy to change my diet a bit and try new things from the internet, but to fall into an exercise routine and then follow it through for a long time, em, it is very hard to stay motivated.'*

Another subtheme relating to motivation was **time and tiredness** interfering, especially with the motivation to cook healthily and to exercise regularly:

4C: *'...eating properly is the hard thing to do on a shift... You don't have time really to stop and to have an actual meal...and when you get home you are so tired you don't want to then go and cook a meal'*

Four participants said that **slow results** caused them to lose motivation:

3A: *'...I do start to go to the gym and this lasts for a few days and then I can't see any difference in myself and I just get impatient and the drive just goes.'*

Three participants described their **limited knowledge** of healthy nutrition and physical activity, which they found to be a barrier to getting started with adequate weight management. Even when participants felt they had some knowledge and interest in nutrition, they found the lack of scientific consensus in online nutrition and exercise advice confusing:

5A: *'It is very very very confusing because the sciences often contradict each-other for a start, so that's one area that needs to be looked at, to actually clarify facts and actually come to some sort of agreement, or more agreement.'*

Many participants stated they had **no control over food cravings** and felt helpless:

4A: *'I have no control. I can't eat [just] a bit of chocolate, if I see chocolate...'*

Although social support could be motivating, there were also instances of **unhelpful social influences**:

1B: *'I have no one to motivate me. My husband, if he could, would sit there all day in his chair, in front of the TV and that's it. So no, it's demotivating.'*

4A: *'No, they [my GP] just said: Well, you're the same weight you were ten years ago and they were kind of saying I wasn't overweight and I feel, yeah, they must be crazy...Cos I thought they were quite keen on getting people to lose weight and I clearly am overweight and they were just acting sort of like there wasn't anything wrong with me.'*

Although over half of participants highlighted the benefits of social media, other participants across groups described possible down sides to social media in regards to diet and exercise. Here is one example:

4A: *'I find it quite demotivating when you are not doing well...and everybody knows about it... But if you are doing well you feel great and might think: Hang on,*

I can share this and motivate others and I'd be happy to post it. But when it's kind of negative things, I found it was really frustrating.'

2.3.2 Previous experiences with weight-loss programs

Advantages

Most participants had previous experience with weight management and had either enrolled in a comprehensive weight loss programme, such as 'Slimming World', or had used Web-based and app support to lose weight and become more active.

The benefits of **peer support** were highlighted by a number of participants:

4B: *'...I believe Weight Watchers come out quite well in this, there is an association with peer support... but also embarrassment when you are not succeeding.'*

Apps overall were viewed as helpful in terms of being portable, informative and giving users 24/7 access and support:

5A: *'...Apps are easy to use at anytime and anywhere and that's another way to do it.'*

Apps could also provide useful information:

4A: *'I did MyFitnessPal ... I've used it last year and found it very good. It basically scans things. So say if you are going to eat like yoghurt, you scan the barcode and it'll come up with what it is.'*

One participant mentioned that apps provide useful 'aftercare':

6D: *'...I mean I know that the Slimming World app for example doesn't stop you being part of the community once you have reached your goal, but you can continue to use it for the nutritional, like health information and ask questions and answer questions....'*

Limitations

The majority of participants in this study expressed a **dislike of calorie counting**, especially when required for weight loss app support:

2D: *'...it calculates it, like em, how many calories you have got left to use up in the day... It tells you how on track you are. But I really didn't like it cos I don't like counting.'*

Further, participants predominately said they disliked MyFitnessPal because of the focus on calorie counting:

Other participants described how they started obsessing about food/calories when using standard diet apps:

6F: *'I got a bit obsessive with calorie counting and I got to the point where I said: 'Oh no, I'd better not have milk in my tea; that's another 18 calories.' And it became far too, in my brain, almost a bit obsessive...and there was no enjoyment in anything that I ate because I was thinking about it per mouthful, per calorie.'*

There was consensus across groups that modern diet and exercise apps are **too complex**, sometimes malfunction and annoy users:

4A: *'... I used it only for four days now and I can't be dealing with it. It is too much input, too annoying and automatically goes to share on the social media and I want a choice and simple things, not over kill. They remind you constantly if you have not filled everything in for that day ...'*

2A: *'...With My Fitness Pal I deleted it because it was so complicated and had, em this narrow calorie counting focus.'*

A number of participants also raised the issue of **apps not being personal**

2D: *'Yeah, in MyFitnessPal it asks you like, em what is your calorie goal, or like activity goal for this week and then it calculates it all for you based on, em all the input... it feels basically really not very personal or like it doesn't grab you...'*

Some participants expressed concern about the typical weight-regain people experience after having slimmed down with the help of a weight-loss program. In the following example one participant talks about their friends' struggle with the **lack of long-term support**:

6F: *'I've got friends that go to Slimming World and Weight Watchers and all they seem to do now is get weighed each week and...once they get near to where they want to be the weight goes back on.'*

2.3.3. Desired Changes for support

App Support

When participants talked about what type of support they would like to help them make changes to their diet or exercise behaviours, they frequently proposed **app support and suggested potentially helpful app features**:

4A: *'I would use alarms on my phone probably. Or even if there could be a very simple, easy to run app?'*

Participant 6C, who had previous experience with FIT, suspected that app support would have helped her stay on track with FIT:

6C: *'...I want to pick it up again... if I had had something to remind me, like the app, I would have continued because it just went out of my mind...'*

Those participants who had poorer knowledge of nutrition and exercise wished for a link to nutrition and exercise info to be added to weight loss and exercise apps:

3A: *'It's like everywhere you look, tells you different information. So, if you had it all in one place and you'd stick to that...So a link for meal planning and how to be more active would be very important to people like I.'*

Motivational features

The majority of participants suggested motivational features they wished to have included on a weight loss support app, such as a space to input and **review ones' goals**:

2D: *'So if I could review and set goals like on that app here or even the imagery app. It would like encourage me I think. '*

A number of participants expressed the desire for getting into a **routine** with making changes to their lifestyle:

1C: *'... I think what I would like to do actually is get into some sort of routine. Like, I know it will be hard the first two or three weeks, but then it em will get easier...'*

Even though participants would appreciate a routine with set times to exercise or pay special attention to their diet, they unanimously warned us they would not appreciate **too many reminders from apps**:

1C: *'...too many alarms are definitely not good, maybe a snooze function would work, kind of that I can press when I happen to be busy ...that would really work for me. I would really kind of start now.'*

Participants wished to choose their own alarm/reminder times, relating to their diet and activity goals:

2C: *'It would be best to set reminders on the phone or apps ourselves. It would have to be my own schedule...'*

Many participants that were using pictures in one way or another to motivate themselves suggested further **personalisation** via photo attachments on apps:

2D: *'...And then maybe I would use a picture of my running shoes to remind me of those goals...'*

The advantages of personal photos often emerged from participants discussing how they routinely ignored generic reminders, set by them or generated by weight loss or exercise apps:

1B: *'I just always switched the reminder alarms off, maybe because I had no picture attached that meant anything to me.'*

A number of participants said they would like to be able to upload music to apps, songs that motivate them and that are connected to their physical activity ideas:

6A: *'uploading motivational music I think it is something that could help me...'*

Over all it appeared that participants wished to **have control** over how they would utilise lifestyle apps:

4C: *'I think it's nice when you are controlling like all of it...'*

In regards to **rewards on apps**, participants generally felt such a feature should be included. Some suggested motivational messages or little badges:

6A: *'I think even something simple like a gold star with a little message like: You have come so far, don't give up now. Or something you know like that. It doesn't have to be anything major.'*

Others requested something along the lines of an 'I did it button' and doubted that impersonal badges could be useful:

5B: *'...it is more for myself in my case, my motivation and I think that something like that would be good to have. I don't think just a badge on a screen is going to motivate a lot of people...'*

Several participants suggested the inclusion of a **progress report** pages to help them visualise their efforts more effectively:

4C: *'...maybe you can add a progress page also...'*

A few participants raised the issue of purely virtual rewards not being enough to motivate people and suggested 'real world' rewards instead.

5C: *'I think it'd be great to earn coins over time that eventually could make up vouchers.'*

A small number of participants said they would like to **compete against others** within an app community to keep them interested:

1A: *'Oh, I would love to win everything, for me it would be very motivating...'*

There were mixed views on the benefits of competition within an app community:

5A: *'If you are one of these people who become discouraged easily it doesn't help. It works for me.'*

Although the majority of participants in this study had announced they used social media for inspiration on weight management, some of them felt it was best to **share progress** and follow others only within a closed app community:

6F: *'I don't think I would share on the social media, but within the app community I think it is important to like inspire and be motivated by others.'*

A few participants spoke out strongly against an option to share from weight loss support apps to social media:

6E *'...Social media is taking over your life. And do we need another app that does that? Really?'*

However, others agreed there should be an option of being able to share within a closed community and social media if they felt like it:

6D: *'I think it should be a choice added to your app, a box you can tick or something.'*

2.3.4 Comments on FIT

Acceptability

After a brief introduction to FIT, participants had a chance to express their understanding of FIT. Participants frequently mentioned **FIT's potential** to change peoples' thinking.

4A: *'Yeah, I mean what you are doing is more of a lifestyle thing isn't it?*

...This FIT training is more like changing your mind-set and teaching you to think differently about food and exercise.'

All, but one participant expressed confidence that FIT could help them improve weight management:

1B: *'I think it looks great and it might just be the kick up the bum from this*

FIT app that we need.'

In one group two participants discussed potential **gender differences** in terms of FIT acceptability and concluded:

6E: *'I think all guys use some level of imagery to be honest. Maybe we*

won't admit it cos we also might get motivated in other ways...So but with the FIT app, it looks great for both genders, so why not?!'

Participants were always asked what **they would imagine** if they were to use FIT. Here is one example:

2B: *'Yes, so what I would do is imagine myself as a very good dancer, nice*

and fit and light on my feet...'

Another two participants addressed the issue of feeling confident in one's own body and how they would use functional imagery to potentially help them achieve this goal:

2A: *'I used to be really self-conscious when I was younger and I had a*

weight problem...even now I don't really like wearing swim suits amongst other things and I am still a bit self-conscious. So if I could use imagery to help that it

would really be a good step for me: To imagine myself confident in my bikini on the beach.'

One participant thought positive imagery would not work for him, suspecting a negative version of FIT might be more useful to him:

1A: 'No, I think the only motivational imagery that would work for me, might be a negative... blocked arteries...and people dying of a heart attack and so on with a pasty in their hand...with the imagery in an app, even if it was simple, I would still not find that motivating enough if it was only positive imagery related to my activities...'

FIT APP support

One participant had received FIT as part of a previous study and suggested an app would be a useful component:

6C: 'I stopped... it's a bit more chaotic at home and I fell out of the habit...I have not put as much weight on as I lost... I lost quite a bit of weight actually during the study...I was really surprised because it was over a short period as well, only three weeks...I want to pick it up again... if I had had something to remind me, like the app, I would have continued because it just went out of my mind...'

Participants welcomed the neutral design and simplicity of the FIT app example slides:

4A: 'It has very neutral colour, a very em neutral screen. Like I said please keep it simple otherwise you will lose people and the slides look really easy to handle.'

Many participants welcomed the inclusion of a mini FIT audio session on the app, to guide them as needed.

1B: 'Oh yes that is good because imagery is still difficult I find at times and this way I suppose I can go over how to do it again if I need to.'

2.4. Discussion

Focus group participants who were currently trying to self-manage their weight found that staying motivated was the hardest part. Some reasons given were similar to those identified in previous research, for example lack of time and energy and controlling cravings (Sharifi et al., 2013; Welsh et al., 2013), but there was a sense that these issues, and also slow results and boredom, made it harder to stay motivated during a weight loss attempt than to get motivated to start one. There was an underlying assumption that participants were tackling this on their own – there was rarely any mention of health care professionals' involvement once weight loss had begun – and would like more support when motivation was waning.

Participants spontaneously mentioned that apps could potentially provide this support by helping them set goals and gain encouragement from other people, features that are known to be effective (National Institute for Health and Clinical Excellence (NICE), 2006; Pagoto et al., 2013) and that are included in some currently available apps (Bardus et al., 2016). They had tried a variety of diet and physical activity apps and voiced frustration with their focus on calorie counting and exercise monitoring. Self-monitoring can be useful at the start of a behaviour change attempt (Steinberg et al., 2013) but our participants found that continual self-monitoring sapped rather than strengthened their motivation. In concordance with their desire for trustworthy information, Breton (Breton et al., 2011) analysed publicly available apps and found that they largely provided advice and monitoring, but could have done much more to build on evidence-based recommendations for exercise and dietary change (e.g., supporting portion control, regular weighing, drinking water instead of sweetened drinks). As an intervention, provision of lifestyle advice on its own is ineffective when delivered through primary care services, so it is unlikely that simply providing it via apps will be very effective (Booth et al., 2015; Laws, 2004).

The reported difficulty with maintaining motivation in our study is consistent with qualitative studies with overweight individuals in other populations wishing to lose weight (Sabinsky et al., 2007; Young, Gittelsohn, Charleston, Felix-Aaron, & Appel, 2010) and with the success of motivational interviewing for weight loss and encouraging physical activity (Armstrong et al., 2011; Franz et al., 2007; Jackson et al., 2011; Mulgrew, Kannis-Dymand, Hughes, Carter, & Kaye, 2016). Although recent studies using online delivery of motivational interviewing in primary care settings have demonstrated encouraging results (Jackson et al., 2011), our participants made it clear that they wanted ongoing support rather than a one-off intervention. They criticised commercial weight-loss programmes such as 'Slimming World' or 'Weight Watchers' for providing continued access to online information on healthy eating or exercise regimes but not continued motivational support, leading to weight regain after completing the programme. Their experiences mirror the report by Fothergill et al. (2016) that all but one of the contestants on a major televised weight loss competition that led to massive amounts of body fat loss had regained weight six years later.

Most participants spontaneously used some strategies to motivate themselves to make healthier eating or physical activity choices, and had ideas for how apps could better support these strategies, for example by facilitating social support, as also recommended by Breton et al., (2011). The option for a share function to be added to motivational mobile support was voiced numerous times, and specifically the option of sharing within a closed community of individuals in similar positions to themselves. Fear of negative attention was also expressed by participants in previous studies of physical activity apps, who preferred to share to a closed group/app community or not at all (Newman, Lauterbach, Munson, Resnick, & Morris, 2011; Price, 2013). (Munson & Consolvo, 2012) found that participants given the option to share their physical activity progress with other app users, via step

counts and messages, were more likely to achieve their daily physical activity goals than those who could not share.

Slow results made it hard to stay motivated and participants noted the potential of apps to sustain motivation by providing rewards and encouraging messages. Opinions varied on the benefits of different types of rewards. Icons and badges (widely used in mobile applications) were felt by some participants to be positive and reinforcing but others felt they had no place when the goal was to become healthier, not to collect badges. Likewise, (Munson & Consolvo, 2012) found the majority of their participants liked being presented with virtual trophies when they achieved certain activity goals; other participants reported it had no influence on their initial motivation. Some participants in the current study desired more tangible rewards, such as money or vouchers. However, a systematic review by (Paul-Ebhohimhen & Avenell, 2008), found no effect of financial incentives on weight loss or maintenance at 12 and 18 months of financial incentive weight-loss interventions. Rewards can be counterproductive, undermining intrinsic motivation to engage in behaviours because they are personally rewarding/enjoyable, or lead to personally valued goals (for a systematic review see: (Ryan & Deci, 2000)).

Participants wanted apps to be very simple and customizable to their own goals and timescales. They wanted apps that could help them set and review goals – an important component of successful behaviour change interventions (Michie, Abraham, Whittington, McAteer, & Gupta, 2009; NICE, 2009) – and which could help them get into healthy routines through reminders and alarms. It was important that these reminders were under the user's control. Participants viewed generic goal reminders, generated by apps at times that were not set by users, as pushy and annoying. Prestwich, Perugini, & Hurling, (2009) directly compared personalised text message reminders to exercise with general or no reminders; only the personalised messages increased exercise levels. Some participants wanted to personalise apps with their own music. Hallett, Wing, & Health, (2016) found

comparable effectiveness of a self-chosen pre-exercise piece of music and implementation intentions, in meeting exercise targets.

Other participants wanted to upload personal photos, consistent with their spontaneous use of pictures to boost motivation. According to EI theory (Kavanagh et al., 2005), mental imagery supports motivation by emulating the rewarding feeling of achieving one's goals. Physical pictures or photos can help trigger motivating mental imagery, but this imagery can also demotivate if the goal is mentally detached from a clear path for achieving it (Oettingen et al., 2010). Functional Imagery Training (Andrade et al., 2016) uses short interview sessions to set and build desire for specific, achievable sub-goals by training participants to imagine positive changes that might happen very soon (for example, how their skin will glow after exercising today, or how well they will sleep tonight), to imagine the specific actions they will take to achieve sub-goals, and to identify and imagine using techniques that have worked for them in the past when they have needed to use 'willpower' (Andrade et al., 2016). After a short introduction to FIT, all but one participant felt confident that proximal goal-directed imagery would be a valuable skill they could use to help them sustain motivation. One summarised it as a way of "changing your mind-set". They welcomed the simplicity of the FIT app and the guided imagery audio that would support their practice.

There are several limitations to the current study. One limitation of this is that we did not ask participants systematically about their past experiences. This was a deliberate strategy as we wanted to explore the sum of people's experiences and the issues that bore most strongly on their current experience of weight management.

In terms of evaluating the FIT app, an important limitation is that we did not give participants a chance to try out the app because it was still under development, so their responses were based on screenshots rather than actual use. We also did not want to prejudice their discussion of app support in general. The FIT app is now being included in

trials of FIT but evaluation of its usability and engagement using the MARS scale (Bardus et al., 2016; Stoyanov et al., 2015) is a topic for future research.

Our focus groups were on average low in numbers. We acknowledge small groups can face several issues: A) it may be harder to facilitate an active discussion amongst fewer individuals, b) participants may be more sensitive to the other individuals in the smaller groups, impacting on group dynamics, and c) related to this point, the overall group functioning is more likely to be affected by 'experts' dominating small group discussions, participants teaming up in friendship pairs, or uncooperative individuals when groups are smaller (Morgan, 1997). In our case, the facilitator noted that in the small groups that were run, individuals treated each other with respect and were passionate about the subject matter. Small groups made it possible to give each individual more time to express themselves, to gain a clear sense of how they felt about the issues discussed, so these expected hindrances were not observed. It has been noted that inexperienced group facilitators can be overwhelmed with the facilitation of large group discussions, often resulting in limited productivity (Morgan, 1997). Future research could include a measure such as The Group Dynamics Inventory (Phan, Rivera, Volker, Garrett, 2004) to capture the overall group dynamics. This way an accurate representation of the dynamics of each group could be reported, enabling researchers and readers to reflect on the validity of focus group research results.

Although there are commonalities between our results and those issues routinely reported by individuals enrolled in weight-loss trials, our current data stem from a small select sample of participants from a university maintained public volunteer pool. They were motivated and active participants; there is uncertainty whether the current sample can be generalised to the wider population (Bauer & Gaskell, 2000). We cannot know for sure if we captured a wide enough range of representations of issues and opinions which may vary in comparison to individuals of perhaps other socio-economic backgrounds who may

not routinely sign up for university led research (Bauer & Gaskell, 2000). Future research could aim to extend this research in the wider population, sampling purposively to assure that a broad spectrum of society is represented, minimize self-selection biases and gender imbalance, and increase reliability of results and transferability. Generalisability is an important issue here because health risks associated with overweight and obesity differ across race.

Another limitation was that we had few men in the focus group sample, around 32%. We cannot say if motivational interventions work differently for men or women, or if motivation is a barrier to men in weight-loss and its maintenance. Some limited qualitative research has shown that men struggle with motivation to lose weight much in the same way women do. In Sabinsky et al. (2007), Danish working men taking part in a work-place weight-loss and physical activity intervention, described lack of motivation as one of two main barriers to losing weight and getting fit. Future research should focus on recruiting more men.

In conclusion, participants who were trying to self-manage their weight found that staying motivated was the hardest part. They wanted apps that gave them control and encouragement. Future apps could support motivation more effectively by using photos and reminders tailored to individuals' personal goals, giving progress reports and help with setting new goals when earlier ones have been achieved, and providing access to social support from other app users. These developments are already technologically possible, are supported by evidence on behaviour change interventions (Andrade et al., 2016; Michie et al., 2009; Michie et al., 2011, Whittington et al., 2009; NICE, 2009), and would satisfy people's desire to self-manage their weight with motivational support available whenever they need it.

Chapter 3: Functional Imagery Training for weight loss and weight loss maintenance: A 15-month pilot study

Study 1 showed that people welcomed FIT in principle, giving confidence that we could recruit and run a pilot study of FIT for weight loss. This chapter reports that pilot study.

3.1. Background

Here we test FIT for supporting motivation to lose weight. Specifically, the use of personalised mental imagery to help individuals start, or maintain, a physical activity routine and to make self-chosen healthy adjustments to their eating habits was taught. We predicted increases in motivation and reductions in weight during the active phase of the trial (baseline – 3 months) and maintained weight loss after the intervention had ended (3 – 15 months).

3.2. Method

Participants

A total of 22 participants (5 male, 17 female) aged 20-63 ($M=39.3$) were recruited from the university department participation pool via email two weeks before the trial began. The pool maintains around 860 members of the general public who have an online account allowing them to sign up to psychology research being conducted at our university. The email targeted specifically those members of the pool who had a BMI of 25kg/m^2 or above, wished to lose weight and become more physically active. Pregnant individuals and/or people who reported a history of eating disorders, were excluded.

Participants received £10 at the beginning of the study, a reward for filling in scales and food/exercise diaries at baseline and a £10 bonus at three-month follow-up and £4 at 15-month follow-up for completing another two sets of diaries and scales.

Design

A three month, single-arm study (Evans, 2010), with follow up at 15 months.

FIT Intervention

FIT session 1 (Physical activity, delivered in person, 50- 60 minutes)

The researcher acknowledged the participant's wish to lose weight and to become more physically active. She suggested a focus on physical activity for the first FIT session (session 1 manual, Appendix A, 1.), with the promise to discuss possible changes to diet (on the phone) in the second FIT session, one week later. Participants were asked about ideas they might already have around what physical activities they would like to start or do more of, to help them become more active.

A brief explanation of mental imagery followed. The researcher guided participants through an exercise in which they had to imagine, seeing, holding, slicing and squeezing a lemon. This exercise, taken from Holmes and Matthews (2005), helped illustrate the multisensory aspects of mental imagery, such as vision, touch, taste (such as drinking the lemon juice) and smell (for example the fragrant skin of the lemon) and to demonstrate the links between emotions and mental imagery (for example, surprise, when juice squirts into their eyes).

Participants were encouraged to consider the negative effects of the amount of physical activity they were currently engaging in and any improvements they might see after a week, then a month, of increasing this activity, by means of their choice. After summarizing those issues and eliciting an emotional response from participants, they were asked to imagine they had succeeded at achieving their physical activity goal and how they might feel, where they might be, when that had happened. Another imagery exercise followed, focusing on the individual steps towards their goal.

Participants were asked to rate firstly, how vivid their mental imagery was when following through the process of working on and of achieving their goal, to provide an

opportunity to reassure them if the imagery was not very clear or easily formed at this stage. Secondly, participants' confidence in increasing their physical activity via their self-chosen strategy for the following week was assessed. This allowed comparison of early assessment of confidence with a second rating towards the end of the session, to illustrate to our participants that thinking of past successes and finding ways to overcome barriers has had an effect on their self-efficacy and motivation.

Following this, they were asked about past successes with increasing physical activity or any other goal requiring self-control. They recreated one of those memories, using imagery, and considered whether any of those past ideas could be used to help them with their physical activity goal now. After imagining getting started with their goal they also worked on overcoming any potential barriers to implementation of their strategy, before re-rating their confidence.

Participants briefly reviewed their plan for the next few days (how they will get started and what they will do to stay in control) and how good they will feel when they have succeeded, before nominating a frequent routine behaviour (such as making a cup of tea or walking down stairs) that they could use as a prompt to practise their personalised physical activity imagery. The researcher encouraged participants to carry out this behaviour in the lab, while imagining all the steps involved in working on and achieving their goal. Participants who had nominated a behaviour that was not easily accommodated by the lab facilities, practised pouring a glass of water, while simultaneously rehearsing their action and goal imagery. They were encouraged to practise the imagery whenever they engaged in the chosen routine behaviour and to set 'imagery practise reminders' on their mobile phone or to place a note on their fridge door that would help them remember to practise.

After a brief session review, a phone appointment for the second and final FIT session was negotiated.

FIT session 2 (Diet, delivered by phone, 30-35 minutes)

The researcher acknowledged any progress, set-backs, issues participants had faced over the past week, in terms of using the imagery and working on their physical activity goals and reaffirmed participants' efforts.

The remaining session followed the same structure as session one, with the main focus being dietary changes and the new addition of an exercise to manage food or drinks cravings, if participants identified food cravings as a barrier to implementing dietary changes at this stage, (or if they had mentioned it after the session's first imagery exercise, for which they were free to imagine anything pleasurable to them, potentially a food item). The researcher then led them through a 'cravings buster' imagery exercise demonstrating how imagery can be helpful during episodes of food cravings. Specifically, participants were asked briefly to imagine a food they often craved and were then instructed to switch their attention forcefully to their goal image, and encouraged to make the image as vivid and real as possible. Participants were then asked to notice what had happened to the initial food image. I developed this exercise in response to most participants revealing that they suffered with unmanageable food cravings. Because I knew that modality-specific imagery reduces cravings for food (Kemps & Tiggemann, 2007) and imagery in general interferes with carving, due to limited working memory capacity (May et al., 2010), it seemed like a logical and natural progression to develop and add this exercise. Session two ends with the arrangement of a booster phone call. See appendix A, 2., for session 2 manuals.

FIT Booster Call (delivered by phone, five to 15 minutes)

The researcher acknowledged any progress, set-backs or any other issues participants had faced over the past week, in terms of using the imagery and working on their physical activity and dietary goals, reaffirming participants' efforts. If participants were on track and meeting their goals, positive effects were assessed and participants' desires

to add another activity, increase activity, or make additional changes to how they ate or cooked food were probed. If they wished to make any additional changes to goals, or to set new goals, the researcher led them through an imagery exercise to make the steps and end goal more concrete. Participants rated vividness of mental imagery. If participants struggled to meet their goals, original incentives (why), strategies (how) and past successes were reviewed and potentially revised. Participants practised mental imagery on one or more of those arenas, based on their choice of which one may be most helpful based on the participant's circumstances. Participants imagery vividness was assessed and potential barrier to using imagery were discussed. Participants listened to a brief summary of the booster call and were encouraged to keep practising imagery to achieve their goals. A phone appointment for the next booster call was decided. See appendix A, 3. for booster call manual.

Assessments

Weight and Waistline Measures

All participants were weighed on the same Weight Watchers glass precision electronic scale. Weight was recorded in kilograms (kg). Participants' height was measured against the wall with a measuring tape and BMI was calculated and recorded in Excel: Weight in kg/ Height in metres (m) ². Participants' waistline was measured over the belly button in centimetres using a soft measuring tape.

Diet

Participants self-reported all food items and beverages consumed over the four days prior to their first FIT session in a food diary that the researcher had either emailed or posted to them. The diaries instructed participants to record all food and drink items in household measures (such as cups and spoons). If the four days before their first FIT appointment did not include a weekend, they were asked to record food and drink consumption for the weekend and two week days before their appointment. Diet was assessed a second time at six weeks using the same style diary and at the end of trial (12 weeks).

Physical activity

Participants self-reported type, duration and frequency of exercise and any other moderate to intense physical activity for the four days prior to their first FIT session, in an exercise diary that had previously been posted or emailed to them. If the four days before the first FIT session did not include a weekend, they were asked to complete it for the weekend and the two weekdays prior to the first FIT appointment. Participants reported physical activity using the same style diaries at six weeks (mid-trial) and at 12 weeks (end of trial).

Motivational Thought Frequency Scale - Diet and Physical activity (MTF-DP):

The MTF-DP assesses the frequency of cognitive-affective events about changing one's physical activity levels and one's diet, providing an overall measure of the subjective experience of motivation, based on a stable four factor structure of: Intensity, Incentives Imagery, Self-Efficacy Imagery and Availability (Parham et al., 2016; Robinson et al., 2016). However, for this study we used MTF as a general measure of motivational cognition encompassing desire and self-efficacy, and therefore report a single mean MTF score. We assessed frequency over the past week. The MTF-DP is based upon the MTF-Exercise for increasing physical activity (Parham et al., 2016) and the MTF-Alcohol, for reducing problematic alcohol consumption (Robinson et al., 2016). The MTF-DP began: 'Thinking about weighing less and being physically fitter...**over the past week**, how often did you'... please select a number from 0 (never) to 10 (constantly) to answer these questions' and was followed by 12 items, such as '... feel you needed to do it' (Intensity), '... imagine yourself doing it' (Self-efficacy imagery), '...imagine how good it would be to do it', '... other things remind you about it' (Availability), Each item was presented alongside the numbers 0-10, arranged linearly as a visual analogue scale.

Participant experience questionnaire

This was a simple questionnaire requiring mostly forced choice answers and additionally provided a comments section. We asked participants to rate how satisfied they were with the programme they had received (not at all, slightly satisfied, neutral, very satisfied, extremely satisfied). If they would recommend it to a friend, colleague, or family member (no, definitely not; no, I don't think so; Yes, I think so; Yes, definitely).

Additionally, we asked them: Do you think the programme helped you to change your diet (no, definitely not; no, I don't think so; Yes, I think so; Yes, definitely)? And:

Do you think the programme helped you to change your physical activity habits (No, definitely not; no, I don't think so; Yes, I think so; Yes, definitely)?

Finally, we asked if they chose a specific diet or exercise regime (if so, which one) and if they had any comments.

Procedure

Study approval was granted by the University's Faculty of Health and Human Sciences Ethics Committee. Participants gave written informed consent and were tested individually by author LS. Each participant attended three face to face meetings and one telephone meeting and five booster phone calls: A baseline meeting, followed by a phone meeting, fortnightly booster calls, a weigh-in meeting in week 13 and a final meeting at the end of trial (15 months). At the baseline meeting, participants' gender, age, highest completed level of education, occupational status, height and weight were recorded and the first food and exercise diaries were collected. Participants received £10 as a reward for filling in baseline measures. Participants completed the MTF-DP before receiving their first FIT session (50-60min) focusing on physical activity. After one week participants were reminded to complete MTF-DP a second time (paper-based versions given to participants alongside the second and third food and exercise diaries at the end of the baseline

meeting), before receiving the second FIT session (delivered by telephone) which lasted around 35 minutes, focusing mostly on participants' diet goals. For the remaining 11 weeks, participants received fortnightly 5-15 minute-long 'booster' phone calls. During the booster call in week five, participants were reminded to do their food and exercise diaries, marking the mid-trial period. In week six participants were reminded to complete a third set of MTF-DP and food and exercise diaries.

At the beginning of week 13 all remaining participants were reweighed, their waistline measured and the MTF-DP was completed a fourth time. Participants signed a written consent for a follow-up weigh-in in 12 months, before receiving £10 for completing, diaries and motivation questionnaires. There was no contact support provided from three months to 12 months (the maintenance phase). At 15 months participants were invited back and weighed and measured once more, on the same set of scales. They received £4 for their time/travel and were fully debriefed.

A note on the absence of app use in the pilot trial

For this study, we were not able to use the 'Goal in Mind' app because it had not been fully developed by the time we started the pilot trial. The app was originally developed in the context of a FIT alcohol dependency reduction RCT, led by David Kavangh in Australia and they had experienced some delays, due to a change in programming staff. I decided it would be best to get started and not wait, so we could wrap up the three-month long FIT intervention phase before the start of (rather than during) the Christmas holidays, in order to maximise follow-up attendance.

3.3. Results

Five participants dropped out of the trial. These were the only undergraduate students in the study. The remaining 17 participants, with an age range of 25–70 years of age (Mage= 39; (4 men and 13 women)) completed the study and had a Mean baseline BMI of 29.42 kg/m² (BMI Range 24-37, Mean age 41.1, Mean weight 83.52 kg, Mean

waistline 100.82 cm). The exercise and diet diaries were not subjected to any analysis due to the lack of complete data. The researcher received a completed set of diet and exercise from 16 out of 17 participants at baseline. 11 participants completed their mid-trial diaries and 11 participants handed in their third set of diaries at follow-up.

Weight and waistline changes at three months:

Weight reduced from a mean baseline weight of 83.52 kg (M baseline BMI 27.5kg/m²) to a M of 79.21 kg at week 13 follow-up (M BMI 26.1kg/m²). 13 out of 17 participants achieved a clinically meaningful 3% of their body weight or more. The mean body weight change for all was 7%; overall mean weight loss 4.3 kg, none of the participants gained weight. Waistline (baseline mean waistline 100.82 cm) reduced at week 13, by a minimum of 2cm and a maximum of 21cm (mean waistline change 8.6cm, follow-up mean waistline 92.7cm). A repeated measures MANOVA confirmed reductions for weight (kg) and waistline (cm) over time (Pillai's trace=. 99 $F(2,15) = 487.02$, $p < .001$, $\eta^2 = .99$. Post hoc tests using the LSD correction showed a reduction of weight from baseline (M=83.51 kg, SD=11.62) to follow-up (M=79.21 kg, SD=10.57) $p < .001$, 95% CI [2.7,5.9]. There was also decrease in waistline from baseline (M=100.82 cm, SD=15.3) to follow-up (M=92.70 cm, SD=12.90) $p < .001$, 95% CI [5.1,11.1].

Weight and waistline changes at 15 months:

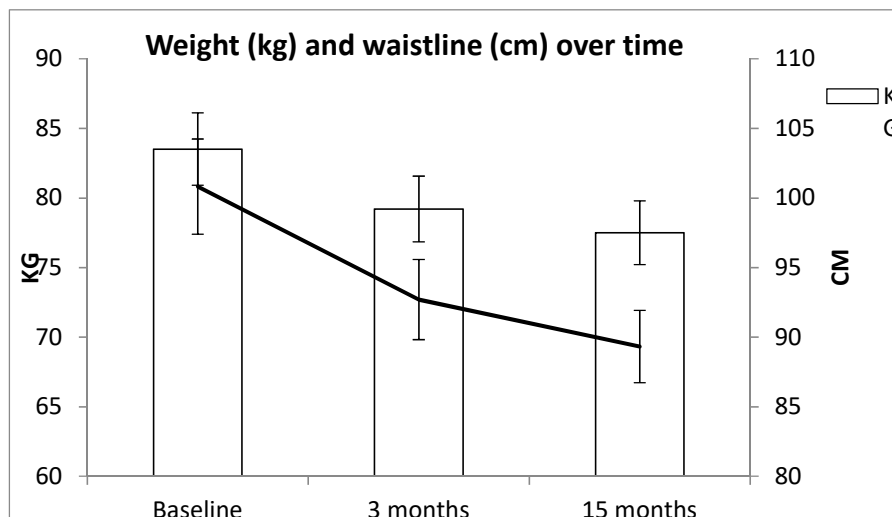
Weight reduced from a mean baseline weight of 83.52 kg (M BMI= 27.5kg/m²) to a mean of 77.5 kg (M BMI=25.5kg/m²) at 15 months. 11 out of 17 participants achieved clinically meaningful weight loss of 5% of their body weight or more, with a mean body weight change of 7% and a mean weight loss of 6.02 kg. One person gained weight.

A repeated measures ANOVA, using the Greenhouse-Geisser correction, confirmed reductions for weight (kg) over time $F(1.12,17.95) = 19.08$, $p < .001$. Post hoc tests using LSD showed a reduction of weight from baseline (M kg=83.52, SD=11.62) to follow-up at 15 months (M kg= 77.5, SD= 10.25) $p = .04$, 95% CI [-9, -3.1].

All participants' waistline (baseline M waistline= 100.82 cm) had reduced by a minimum of 3.5 cm and a maximum of 29 cm (M waistline change = 11.5 cm, M waistline =92.71 cm) by 15 months.

A repeated measures ANOVA, using the Greenhouse-Geisser correction, showed decreases in waistline (cm) over time $F(1.40, 22.46) = 34.16, p < .001$. Post hoc tests using LSD showed a reduction of waistline from baseline (M =100.82 cm, SD=15.3) to follow-up at 15 months (M= 89.32 cm, SD= 11.65) $p < .003$, 95% CI [-15.3,-7.7] (See figure 3.).

Figure 3. Showing weight (kg) and waistline (cm) over time:

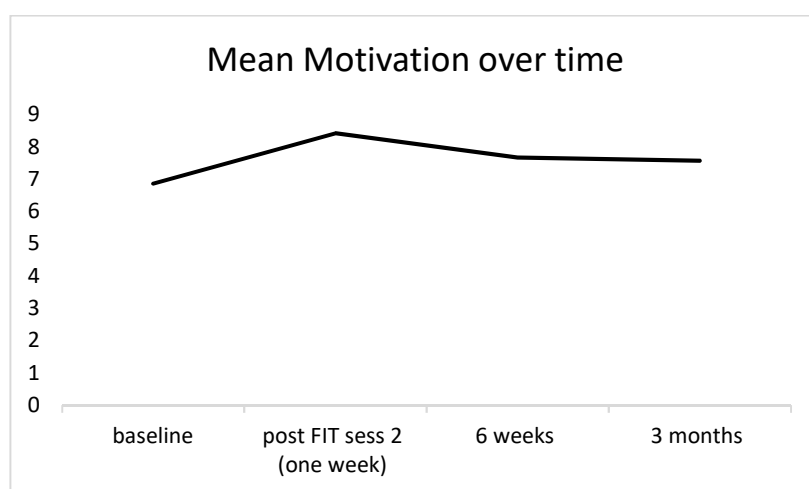


Motivational Thought Frequency Scale - Diet and Physical activity MTF-DP, baseline to three months:

A repeated measures ANOVA, using the Greenhouse-Geisser correction, confirmed that the overall frequency of motivational thoughts (MTF-DP) about being more physically active and making changes to one's diet increased highly statistically significantly over time $F(2,31.60) = 4, p = .014$. Specifically, LSD post hoc analysis showed that the frequency of motivational thoughts increased significantly from baseline (M= 6.86, SD=1.10) to time 2 (one week after the first FIT session, M=8.42, SD=.85) $p < .001$, 95% CI [-2.13,1], increased

significantly from time 2 to time 3 (6 weeks/mid-trial, $M=7.67$, $SD=1.20$) $p=.03$, 95% CI [-1.62,0], with no significant changes from mid-trial to follow-up at three months (time 4, $M=7.57$, $SD=2.19$) $p>.05$, 95% CI [2,.50]. The rate at which motivational cognitions occurred was highest after the second FIT session and did not drop down to baseline levels over the first three months of trial, but remained high. (See figure 4.)

Figure 4. Showing mean changes in motivation (frequency) over time



Participant experience questionnaire outcomes

Seventeen out of 23 participants completed the participant experience questionnaire at 3 months follow-up. 16 reported they were extremely satisfied with the programme and that they would definitely recommend it to a friend, colleague, or family member. One participant reported they were very satisfied with the programme and they thought they would recommend FIT. All 17 participants said that FIT definitely helped them to make changes to their diet and physical activity habits and only one participant joined Slimming World to help them along, the others named lifestyle changes only. Eight participants commented that they would like an app, or web-site as additional support materials for FIT.

3.4. Discussion

In line with the first hypothesis, two sessions of FIT and four brief booster phone calls, amounting to a maximum of only 2 hours and 45 minutes of contact time over three months, were followed by statistically and clinically significant weight loss, at three months. These changes were maintained at 15 months after an unsupported 12-month maintenance phase (average % weight loss was 7% at 15 months). Sustained reductions of around 5% of body weight can bring significant clinical improvements, with ample literature suggesting significant health benefits, such as decreasing blood lipids, precursors of Type 2 diabetes and improving blood pressure (Donnelly et al., 2009; Jakicic et al., 2001). All participants achieved a reduction in waist circumference, at three and 15 months, which brings its own health risk reductions. Excess abdominal fat indicated by a high waist circumference, in men (>102 cm), presents a five times higher risk of developing diabetes diagnosis, whereas women with raised waistlines (>88cm) are over three times more likely to become affected (Gatineau et al. 2014).

Andrade et al. (2016) showed that FIT could reduce a specific eating behaviour, snacking on high calorie foods. Here these findings were extended to a focus on numerous self-set goals, incorporating both healthy eating and physical activity, and demonstrated its potential to assist weight loss in participants with overweight and obesity.

Because this was a study with only one treatment arm, it cannot be claimed that weight loss and waistline reductions were mediated exclusively by the FIT intervention. It is plausible that participants enrolled in weight loss trials might be more likely to start paying attention to their physical activity levels and diet and these losses might therefore, in part, be explained by the Hawthorne effect (e.g. Merikle & Skanes, 1992). However, the objective was to gather preliminary evidence for the potential efficacy of the FIT intervention and the single-armed design is recommended by the National Institute of Health (NIH), before beginning preparations for an actual efficacy trial (Evans, 2010).

Another limitation was that we had few men in the pilot, around 31%. We cannot say if motivational interventions work differently for men or women, given our sample. We do assume that motivational cognitive interventions should work in similar ways for both genders. Qualitative research has shown that men struggle with motivation to lose weight much in the same way women do. In Sabinsky et al. (2007), Danish working men described lack of motivation as one of two main barriers to losing weight and getting fit. Future research should focus on recruiting more men to test if cognitive and behavioural interventions work as well for men as they do for women.

Another issue that might have influenced the results in the present study was the fact that participants were recruited from a public pool maintained by a University, of people who had expressed an interest in taking part in research and especially in losing weight and becoming more active. These participants might have been more motivated from the start than the general population (Simpson, Shaw, & McNamara, 2011); participants started off with high baseline motivation ratings. However, a recent large scale randomised trial established that the majority of people with obesity who were invited by their GP to take part in a weight loss trial, were in fact willing to join the study (83% of 2728), without any prior assessment of their readiness for change (Aveyard et al., 2016). Aveyard et al. (2016), randomised participants to either a control group, where weight loss was self-directed, or to a 12-week behavioural weight loss programme (one hour long counselling session a week). Participants lost on average 2.43 Kg in the supported group, by 12 months, compared to mean weight loss of 1.04 Kg in the self-directed group. This indicates that even individuals who might not have previously felt, or expressed any motivation to better manage their weight, could be willing to lose weight, given an opportunity to do so (Aveyard et al., 2016).

Studies documenting ongoing weight loss past the end of treatment are rare (Kozica et al., 2015). Initial weight loss can be maintained, as in the 'Look AHEAD' trial,

reporting sustained 5% weight loss in 50% of patients at eight years, who had diabetes with overweight or obesity (Wadden, 2014). However, 'Look Ahead' was a high intensity lifestyle intervention that provided comprehensive behavioural weight loss counselling over the entire trial duration. Svetkey et al. (2008), showed further that weight loss maintenance could only be achieved when additional support was provided, after six months of behavioural weight loss support, compared to self-directed means. These studies demonstrate that in order to experience ongoing weight loss, or to prevent regain, people have to be willing to commit for quite some time, and recruit ongoing support to maintain the initial drop in weight (Svetkey et al., 2008; Truby et al., 2006; Wing & Phelan, 2005).

The current results suggest potential for FIT in assisting long-term weight loss and maintenance, without dependence on ongoing external support, by training a cognitive habit of goal-related imagery to maintain motivation. This motivation stems, in part, from personalised mental imagery about functional behaviour change goals, the belief that they are attainable, strengthened via episodic imagery. We therefore teach FIT as a flexible tool, enabling participants to use their now fine-tuned ability, to set highly emotive, achievable, proximal and vivid sub goals whenever they wish to, or need to. Individuals can rehearse personalised imagery episodes and experience the rewarding feeling of reaching their sub-goals, including practise for overcoming barriers, when they know that challenging situations might occur, while steadily striving towards an overarching desirable long-term goal. While this process unfolds and new behaviours become routine, imagery can also help to diminish cravings at times where individuals might be at risk of succumbing to dysfunctional temptations (Kavanagh, Andrade, & May, 2005), they could not plan for. This should strengthen self-efficacy for future success further, which in itself is known to be motivating (Bandura, 1989; DiMarco, Klein, Clark, & Wilson, 2009; Williams & French, 2011).

Consistent with the hypothesis that changes in motivation would occur over the actively supported first three months of the FIT intervention, we saw significant increases for motivation from baseline. Motivation was at its highest point directly after the second FIT session, levelling out somewhat by mid-trial at six weeks, but staying high and not dropping back to base line levels at three months. Due to the nature of our research design we cannot claim that the changes in motivation have been engendered purely by the FIT intervention. FIT is delivered in the goal-orientated, collaborative style of MI (Miller & Rollnick, 2009) which is known to foster weight loss and which is successful in eliciting and supporting motivation (Armstrong et al., 2011; Rubak et al., 2005).

Another shared element of MI and FIT is the aim to build self-efficacy for goal pursuit and goal attainment (Miller & Rollnick, 2012; Andrade et al. 2016). In FIT this is achieved via imaginal exploration of past successes with behaviour change and rehearsing future scenarios, especially those where barriers obstructing a functional goal need to be addressed and overcome. In MI, the same aspects are usually addressed, but via verbal discussion and elicitation of self-talk, without placing direct emphasis on personally salient goal-related imagery. Here, we have not measured self-efficacy experimentally, however, given that self-efficacy is an important predictor of behaviour change (Bandura, 2001; Michie et al., 2011; Michie et al., 2009) and that both FIT and MI are aimed at increasing it, self-efficacy for behaviour change should be assessed in future studies of FIT. In summary, to draw solid conclusions about the direct mechanisms underpinning FIT and whether motivation for weight loss and weight loss maintenance are moderated via these mechanisms, as predicted by EI theory (Kavanagh et al., 2005), future research should directly compare FIT with MI, including measures of motivation, imagery and self-efficacy in both treatment arms.

Participants in the current experiment voiced some dissatisfaction, about the food and exercise diaries they were asked to complete, further reflected by the low return rate

and our subsequent decision to exclude them from the data analysis. Self-monitoring is undoubtedly an important element in long-term weight loss (Burke, 2011; Steinberg et al., 2013), but it needs to be tailored to the individual's own time frames and lifestyle (Solbrig et al., 2017). Since FIT's aim is to increase and support motivation for change, future studies should include less time intensive means of assessing diet and physical activity, such as well-designed and easy to use apps, food frequency questionnaires and physical activity questionnaires, to gain more insight into whether FIT has affected healthy changes in diet and activity, without the danger of reducing motivation.

Increasing lifestyle activity appears to be beneficial to weight loss. Andersen et al (1999) for example, combined a dietary intervention with increased lifestyle activity and reported weight loss results akin to aerobic exercise in their participants at 16 and 68 weeks. We did not prescribe a diet or exercise regime, but trusted that participants already knew what changes they could commit to and if participants wished to join a commercial programme, such as Slimming World, we did not see this as a contamination of our results, but rather as evidence that they now had the motivation necessary to commit to a structured change. One of the 17 participants joined Slimming World, whereas the remaining participants had reported achieving their goals overwhelmingly by lifestyle changes, such as increasing walking, cycling to work, using stairs instead of lifts and cutting out snacks, as well as tackling portion control and reducing alcohol intake. The majority of participants reported that they liked the lifestyle changes they had made and especially enjoyed visualising themselves engaging in these.

Echoing qualitative results from Solbrig et al. (2017), namely that people who try to manage their weight want app support and social support, via an online community, many participants expressed the wish for a FIT app and a social online platform for sharing information and gaining inspiration from others enrolled in FIT trials. Social support is known to be a vital element in weight loss maintenance (Metzgar, Preston, Miller, &

Nickols-Richardson, 2014), encouraging physical activity (Consolvo, Everitt, Smith, & Landay, 2006; Munson & Consolvo, 2012) and boosting effectiveness of dietary and physical activity interventions (Greaves et al., 2011), be that in person, or online.

Technology assisted weight loss has already been successful at increasing healthy diet choices and exercise, especially when motivational components are included (Jackson et al., 2011) and in promoting clinically and statistically significant weight loss, even in comparison to in-person delivered behavioural weight loss programmes (Appel et al., 2011). Future trials of FIT, or other motivational interventions, could include technology supported elements, such as websites and apps, with an option to share information via a closed online community, creating the most effective weight loss and maintenance conditions possible. The 'Goal in Mind' app was finished just in time for the RCT (chapter 6) and could be offered as a support tool to the FIT group.

Overall these pilot results suggest promise of FIT as a brief intervention for long-term weight loss and weight loss maintenance, without dependence on ongoing therapy after the initial treatment phase. We now need larger trials comparing FIT directly with MI, time and contact matched; first to test if FIT can be an efficacious tool for long-term weight loss, when compared to an active control and second, to assess if FIT can sustain motivation more effectively than MI.

Chapter 4: Overview of methods for chapters 5, 6 and 7, reporting studies 3, 4 and 5.

Chapters 5, 6 and 7 report studies 3, 4 and 5, which were part of the same RCT. Chapter 5, study 3, reports secondary outcomes from the RCT. It investigates the impact of FIT, compared to MI, on motivation and self-efficacy, over the first month of the weight-loss RCT in overweight and obese community volunteers. Chapter 6, study 4, focuses on the primary outcomes from the RCT for weight-loss, comparing FIT and MI over an intervention-supported six-month period, followed by six months unsupported. Chapter 7 (study 5), qualitatively explores experiences of MI and FIT RCT participants, upon completing the 6-month RCT intervention phase.

Chapter 4 presents the overall methods used for study 4, the primary RCT (chapter 6) data collection and the secondary data collection for the motivation and self-efficacy sub-study 3 (chapter 5) and for the secondary qualitative study 5 (chapter 7).

Please note that details of the transcript analysis of the qualitative RCT (study 4) data (study 5, chapter 7) will be reported separately in chapter 7.

Table 2. Overview of which participants were included in which primary and secondary RCT data analysis:

	RCT secondary outcomes study 3:	RCT primary outcomes study 4:	RCT secondary outcomes study 4:	RCT secondary outcomes study 5:
	Motivation and Self-efficacy data. All who were randomised and completed both assessment points.	Body weight, BMI and waistline. All who were randomised, provided baseline and at least 6month assessment data.	GQL data. All who were randomised, completed both assessments, baseline & 6months.	Qualitative data, all who were randomised and completed questionnaire at 6 months.
N	111	114	114	114

Ethics and trial registration

Study approval was granted by the Faculty of Health and Human Sciences research ethics committee, University of Plymouth, on March 23rd, 2015. The International Standard Randomised Controlled Trials registration was <http://www.isrctn.com/ISRCTN17292316>, 18/07/2016.

Participants and recruitment

We advertised once for potential participants in the *Plymouth Shopper* (appendix E), a free local community newspaper, reaching around 64,000 homes. The advertisement sought adult participants with a BMI ≥ 25 kg/m², to test motivational interventions for losing weight and becoming more active.

Exclusion criteria were current pregnancy, diagnosed eating disorder, and failure to complete primary baseline assessments.

Sample size: A recommended sample size of 191 was estimated using G*Power 3.1.9.2, assuming power of .8 to detect a small effect size of .2 for between-group difference.

Design and overview

The trial was a single-centre, two-armed, single-blind, randomised controlled parallel design with matched therapist contact time, comparing FIT with MI (1:1 ratio of participants). The trial had 6 months of active intervention, followed by a 6-month follow-up period, with no therapist contact. Primary data analyses are reported by intention-to-treat. Secondary data analyses are reported per-protocol.

Table 3. Assessment points for studies 4-6:

Measure	Assessment points				
	Study	Baseline	1 month	6 months	12 months
Self-efficacy physical activity	4	x	x		
Motivation	4	x	x		
Self-efficacy diet	4	x	x		
Weight and height	5	x		x	x
Participant experience questionnaire	6	x		x	

Randomisation and masking

Participants completed demographic details, baseline primary and secondary assessments before randomisation. They were asked by email to access and complete the baseline set of self-efficacy and motivation and global quality of life questionnaires, to read the research information and to give consent (if they felt happy to join the study), via an online link, one week before their initial weight baseline assessment and first therapeutic session. If eligible participants provided online written consent, they were invited to attend a weigh-in and their first therapeutic session at the University of Plymouth the following week, where they also completed demographic information. Participants were randomized to MI or FIT by the lead researcher using <https://www.randomizer.org/> (random pairs option), after baseline height and weight data collection and just before receiving their first

therapeutic session of either FIT or MI. The appointment took place in a comfortable counselling room on the University of Plymouth campus.

Participants returned to the university for two post-treatment assessment sessions, at 6m and 12m. Research assistants (RAs) who were blind to the intervention group collected and recorded primary outcomes. Participants were informed that new RAs would take their measurements, and were asked not to give away whether they were in the FIT or MI group. The lead researcher was present in the room and could verify and record if un-blinding occurred.

The secondary outcomes of global quality of life, self-efficacy, motivation follow-up assessment data were all collected via emailed online questionnaires. Quality of life, was assessed at baseline and for the second and final time at 6 months, one week before 6m weigh-in; motivation and self-efficacy were also assessed at baseline and for the second and final time at 1 month. The qualitative participant experience questionnaire was completed once, at the 6 months follow-up appointment, at a computer in the counselling room, via an anonymous online link before completing primary follow-up assessments.

Analysis of primary outcomes and quality of life was performed by an analyst who was blind to intervention and not otherwise involved in the trial. Analysis of secondary data was performed by LS. Analysis of secondary qualitative data was completed by LS and an RA.

Primary assessment measures

Primary outcomes were body weight, BMI and waistline. Weight (kg) was measured in street clothes, with shoes removed, using Omron BF511 Family Body Composition Monitor. Height was measured to the nearest centimetre, allowing calculation of BMI (kg/m^2). For waistline measurement, participants removed coats and sweatshirts, but no other clothing. Waistline was measured to the nearest centimetre, at the height of the umbilicus, using a tailoring tape measure.

Secondary assessment measures

Global quality of life, measured using the 1-item Global Quality of Life Scale

(GQOL; Hyland & Sodergren, 1996).

Participants in both groups were also asked if they would recommend the treatment they had been allocated to a family member, friend or colleague.

We collected data on process variables, including frequency of motivational cognitions, and self-efficacy for diet and physical activity. *The Motivational Thought Frequency Scale for Diet and Physical Activity (MTF-DP)* assessed frequency of motivation over the past week (see chapter 3.2 Method for a full description). As in chapter 3, we used motivational thought frequency (MTF) as a general measure of motivational cognition encompassing desire and self-efficacy, and therefore report a single mean MTF score.

We also measured self-efficacy using versions of existing scales. We adapted the *Spinal Court Injury Exercise Self-Efficacy Scale* (SCI ESES), originally developed by Kroll et al., 2007, for use with spinal cord injury patients, with items based on the Generalised Efficacy Scale (GSE; Chen, Gully & Eden, 2001). It is a reliable, internally consistent scale, with satisfactory Content and Construct validity (Kroll et al., 2007). The questionnaire begins: 'I am confident that I can...' followed by 10 different statements rated on a 4-point Likert scale with the following anchors: Not at all true, hardly true, moderately true and exactly true. Kroll et al.'s (2007) item pool was informed by Social Cognitive Theory (Bandura, 1989). We changed 'depressed' in statement seven to 'feeling a bit down or ...not in the mood', because even a fleeting low mood might stand in the way of carrying out physical activity. We excluded the statement: '... be physically active or exercise without the help of a therapist or trainer.' and used a statement about social temptations instead: '...that I could be physically active even when social temptations arise.' We wanted to include an element of lifestyle activity and replaced: '...I can motivate myself to

start being physically active or exercising again after I've stopped for a while' with '...I could do my daily activities more vigorously'.

To measure self-efficacy for weight-loss in regards to diet, we used the *Weight Efficacy Lifestyle questionnaire* (WEL; Clark, Abrams, Niaura, Eaton, & Rossi, 1991), a commonly used tool with high validity and reliability (Ames, Heckman, Grothe, & Clark, 2012; Clark et al., 1991). WEL consists of 20 items that load onto five situational factors: Negative emotions (e.g., 'I can resist eating when I am depressed.'), availability ('I can resist eating when I am at a party.'), social pressures ('I can resist eating when I have to say 'no' to others.'), physical discomfort ('I can resist eating when I feel physically run down.') and positive activities ('I can resist eating when I am happy.') (Ames et al., 2012; Clark et al., 1991). All items were rated on a confidence ruler from 0%, not confident at all, to 50%, moderately confident, to 100%, completely confident.

Qualitative participant experience questionnaire

An anonymous questionnaire, delivered online via Survey Monkey™, comprised open-ended questions about a) whether the respondent followed a named diet, b) how this time was different to previous weight-loss attempts, c) outside of losing weight and becoming more active, had any other areas of their life changed as a result of this programme, d) what they liked most and what was not so helpful or could be improved and e) if they had any comments. In the MI group only, we asked about the use of a goal-setting and action plans (use of goal-sheet) and in FIT we asked about the use of imagery throughout the programme.

Interventions

Both interventions were delivered individually by the lead author. Face-to face sessions were all conducted in the same counselling room on the University of Plymouth campus. Session 1 (face-to-face) immediately followed the collection of primary baseline assessments and randomisation, and lasted 1 hour. Session 2 (approximately 35 min) was

delivered by telephone a week later. Participants then received fortnightly 5-15 minute-long 'booster' phone calls until 3 months, followed by monthly calls to 6 months post-baseline.

We developed scripts to guide delivery of MI and FIT and ensure treatment fidelity and consistency (Appendix B, 1- 6), but the order of segments was flexible and guided by the participant's needs and responses, in keeping with the spirit of MI. Active listening (open questions, affirmation, simple and complex reflections, summarising) was used in both treatments. The initial session of MI and FIT had the same general structure, incorporating a negotiated agenda, discussion of the treatment allocation, assessment feedback, existing or potential goals, incentives for adoption of those goals, and past successes with weight loss efforts. The therapist checked degree of goal commitment. Once participants were committed to behaviour change, they developed a plan for action over the following few days, including strategies to address potential barriers to its implementation.

Session 2 reviewed and developed the themes from Session 1, in the light of experiences since the initial session. Booster calls provided opportunities to review progress, reaffirm successful aspects of performance and incentives for behaviour changes, and set additional sub-goals. If participants had requested advice on diet or physical activity they would have been referred to the UK's National Health Service's (NHS) publicly available and accessible NHS Choices website which provides general information and advice on health, for example staying fit, losing weight, or beating stress (<https://www.nhs.uk/pages/home.aspx>). We did not have to refer anyone to this option however.

FIT

After discussion of assessment feedback in Session 1, the therapist explained the rationale for using imagery and gave an experience of affectively-charged imagery, using

the lemon exercise (Pictet & Holmes, 2013). After discussing incentives for potential behaviour change, participants imagined these outcomes occurring, as specific future events that were created as vividly as possible. Similar images were elicited about past successes and about detailed plans for the coming days, including successful achievement of each step and success in reaching their ultimate goal.

Participants nominated a routine behaviour that could prompt their imagery practice. They carried out this behaviour in the counselling room, while imagining their action plan and goal. They were also encouraged to practise imagery before engaging in their chosen behaviour and offered the simple 'Goal in Mind' app (<https://itunes.apple.com/au/app/goal-in-mind/id1289557359?mt=8>; <https://play.google.com/store/apps/details?id=com.goalinmind&hl=en>) to download. They could use the app to upload motivational photos, tick off when they had remembered to do imagery practice (the app did not provide reminders), input a goal they would like to achieve and listen to a five-minute audio that guided them through imagining how they would work on their goal today and how good it would feel to achieve it. The audio was emailed as an MP3 file if participants did not want to use the app, but wanted the audio to practise.

Session 2 reviewed progress, including participants' efforts at practising imagery. Imagery was used to help solve any problems with progress towards their goal and to motivate new sub-goals.

Booster calls developed imagery about recent successes, problem solutions, or new goals behaviours. If required, additional imagery exercises included: 'Cravings Buster' (deliberate switching of attention from craving imagery to goal imagery) and the newly developed 'Plateau' (reflecting on benefits experienced so far and exploring additional ways of working on goals, appendix B, 7.). We developed this exercise specifically to

tackle the common and discouraging problem of weight loss slowing after the initial weeks as the body adjusts to a new diet.

MI

When delivering MI, the therapist did not explicitly evoke imagery, and avoided language that was likely to trigger it. Some additional questions were added to the manual, to ensure that the MI sessions had similar time and intensity as the FIT sessions. A few examples are: “When you think about that list of things, how does it make you feel?”, “Would you mind summarising the things that are likely to get better if you change your behaviour?” and “Is there anyone who could help you follow it through?” MI participants were offered a goal sheet with the action plan they developed with the therapist in the first session; FIT participants did not have this. They took the goal sheet home and were encouraged to review their statements, goals and strategies, especially when they felt they needed extra motivation. Two examples of this additional exercise from the script are: “Would you like to write that down so you have a summary to take away?” and, “If you need a bit of a boost to your motivation over the next few days, you could try reading that over to remind yourself about what you said.” The sections were as follows: What I am going to do...Why I want to do it...How I’ll do it...I know I can do it because.... Participants were encouraged to add to the sheet as their goals or reasons for change evolved. During the booster calls, they were asked if they had added any new goals or ticked off achievements on their sheet. See table 4 for a simple overview of a typical MI and FIT session.

Table 4. Structure of typical motivational interviewing and functional imagery training sessions

Motivational Interviewing	Functional Imagery Training
Welcome, weighing, measuring and randomisation	
Establish mutually trusting and collaborative environment	

Negotiate agenda, participant led, based on their priorities, ideas, hypothetical goal if they already have one	
Recap hypothetical ideas about change and elicit desired hypothetical goal (reflect emotions throughout)	
Briefly probe client's feelings and worries about not making any changes (reflect emotions throughout)	
Discuss how fast first positive changes could occur and how these could translate to specific areas of client's life (build discrepancy)	
<hr/>	
Introduce imagery and complete lemon exercise.	
Assess vividness, emphasise multi-sensory imagery and reassure client if imagery is hard at first.	
<hr/>	
Summarise participant's worries about effects of not changing, then ideas and effects of positive hypothetical change	
Make a more concrete plan: Elicit implementation intention (hypothetical, verbal)	
<hr/>	
Elicit imagery about success of hypothetical plan	
Elicit imagery about more concrete plan/steps and of successful completion of each step (emphasise sub-goal success)	
Elicit imagery about a specific event in one year's time when the end goal has been achieved and the rewarding feeling this would bring (<i>Note: these imagery exercises above are often combined into one longer imagery exercise</i>)	
<hr/>	
Probe self-efficacy with confidence ruler for goal and implementation intentions; reassure doubt	
Discuss past successes of behaviour change, lasting or proximal, unspecific to new goals, or specific to physical activity/dietary change (more briefly for FIT than MI)	
<hr/>	
Ask participant to summarise ideas and strategies	Elicit imagery about past success unspecific to new goals, or specific to physical activity/dietary change
Discuss using those ideas and strategies now	Elicit imagery about using those ideas/strategies now and their immediate success for each sub-goal
<hr/>	

Probe self-efficacy for action plan and goal using confidence ruler	
Briefly discuss potential barriers to getting started; talk about potential solutions	Elicit imagery re coping strategies/solutions to potential issues with plan/overcoming barriers
Fill in the goal sheet	Instigate planning/commitment part (verbal)
	Elicit imagery of plan for the following week and most immediate rewards of working on sub-goals to achieve overarching goal
	Encourage practice of imagery outside of sessions, identify a frequent behaviour to pair imagery practise with.
	Practice imagery alongside another task (where possible).
	Encourage written and phone reminders for imagery
Encourage participants to engage social support	
	Introduce Goal in Mind app or audios (optional, participant chooses)
Review session and give client a chance to ask further questions. Make phone appointment	

Intervention fidelity

The therapist was trained in FIT by two of the creators of FIT and undertook a 3-day MI course. She attended weekly clinical supervision meetings with the senior author, to review individual sessions. A random 20% sample of initial FIT and MI sessions were rated on the Motivational Interviewing Treatment Integrity (MITI) 3.1.1 (Moyers et al., 2010) by an RA not involved in the project. FIT sessions were rated on a 15-item checklist based on the manual. Additionally, two RAs listened to the session recordings independently and categorised them according to the intervention they thought the participants had received.

Procedure

Participants gave informed consent and filled in baseline self-efficacy, motivation and global quality of life questionnaires online, accessed via an emailed link, a week before their initial first weigh-in and therapeutic session. After completing demographic details and all primary baseline assessments in a comfortable counselling room at the University of Plymouth, at the start of their first weigh-in and therapeutic session appointment, they were randomly allocated to MI or FIT. The treatment sessions followed immediately after, as described above.

After the first booster call, at 1 month from baseline, all participants were asked to complete reassessments of the predicted process variables (secondary outcomes): Self-efficacy and motivation. These data are reported in Chapter 5 (study 3).

At the end of active treatment (6 months), they attended a 15-minute post-treatment assessment session in the counselling room. Quality of Life was assessed via emailed questionnaire one week before this session. Qualitative RCT data were collected. Participants filled in the anonymous participant experience questionnaire before being weighed and measured. The questionnaire was set up on a computer in the counselling room, according to participant intervention allocation, by the primary researcher prior to the research assistant and participant entering the room and asking participants to complete the open-ended questionnaire. Completed questionnaires were later assigned a random

participant number from 1-61 for each group. These qualitative data are reported in chapter 7 (study 5).

Following qualitative data collection, RAs blind to intervention measured waist and weight. They were told that the therapist would be available if they were experiencing distress (none took up this offer). Participants were reminded that they were entering the unsupported maintenance period and that the therapist would be in touch 2-3 weeks before the final weigh-in, to arrange the final data collection appointment. They received £15 for their time and travel.

At 12 months, participants returned for the final weigh-in. This session did not include self-report instruments. They received £5 for completing this assessment, which completed data collection for the RCT (chapter 6, study 4).

Data analysis methods for primary RCT outcomes

Weight and waist circumference were analysed separately. To estimate differences between MI and FIT, outcome measurements were regressed onto baseline score (kg or cm), a time indicator (6/12 months), and a group indicator (MI/FIT), using linear mixed-effects models (Bates, Mächler, Bolker, & Walker, 2015). These models also included baseline BMI and its interaction with time and group; baseline BMI was included because it captures additional information about the severity of participants' condition when entering the study. These models are analogous to repeated measures ANCOVA, but allowed us to make efficient use of all available data without imputation of missing values. Of primary interest were the between-groups contrasts for weight and waist circumference at 6 and 12 months. Tests of parameter values and other contrasts are reported with Satterthwaite approximation for degrees of freedom. In a secondary analysis, GQOL scores at 6 months were regressed on baseline GQOL scores, baseline BMI, group, and the interaction of baseline scores with group. Alternative model parameterisations, in which treatment

effects were estimated as a linear slope from baseline to 6 or 12 months, produced equivalent inferences.

To support probability statements about the average effect of FIT vs. MI, and likely prognoses of future participants selecting FIT or MI, we re-ran our mixed models using a Bayesian estimation procedure with pessimistic but weakly informative priors (Gabry & Goodrich, 2016); full details are available in our data supplement, but for regression coefficients these priors were Gaussian, zero-centred, and with a scale adjusted to $2.5 \times \text{SD}(y) / \text{SD}$ (Gabry, & Goodrich, 2016). Based on these models, we provided summaries of the posterior density for the average treatment effect, and for the predicted prognoses of new individuals selecting FIT or MI. All models appeared to converge satisfactorily based on visual inspection of MCMC traces and parameter R-hat statistics (Gelman et al., 2014).

Economic costing:

We used Public Health England's weight management economic assessment tool No.2 (Copley, 2016), to estimate the increase in quality-adjusted life-years (QALY) associated with the additional weight lost by FIT participants at 12-months compared with MI.

No specific analysis plan was devised for secondary RCT outcomes. Please note however that we report Cohen's d (d) throughout chapter 5's results section which is also known as the standardized mean difference (SMD). It is the widely used measure of effect size for reporting on efficacy outcomes that are measured in continuous measurements, such as rating scale scores. It is used for comparing a treatment group to placebo or, when the comparator is another active treatment, for example FIT vs MI (Faraone, 2008). Results will be interpreted in line with Cohen's guidelines for interpreting the magnitude of the SMD in social sciences: Small, $\text{SMD}=0.2$; medium, $\text{SMD}=0.5$; and large, $\text{SMD}=0.8$ (Faraone, 2008).

Chapter 5: Functional imagery training versus motivational interviewing: Effects on motivation and self-efficacy to eat healthily and increase physical activity

Chapter 5 compares the impact of FIT and MI, on motivation and self-efficacy, over the first month of the weight-loss RCT (which follows this chapter), in overweight and obese community volunteers. A sole focus on reporting weight loss outcomes seemed too limited. It was important to us to firstly identify some of the active mechanisms that we propose FIT and MI address, such as motivation and self-efficacy, because of their implication in behaviour change. Secondly, we wanted to test our proposition that adding targeted mental imagery exercises and training on self-management to MI (as we have done with FIT), would enhance self-efficacy and desire for behaviour change further than MI has been able to so far.

5.1 Background

Motivation and self-efficacy are central to health behaviour, with both being important for self-regulation (Bandura, 1977; Miller & Rollnick, 2012b; Ryan et al., 2008; Stich et al., 2009). Motivation is a transient feeling, associated with a behaviour (or a goal) when it is intrinsic, or autonomous that is, when the individual is doing the behaviour (or working towards the goal) because they desire it or enjoy it as opposed to doing it to receive external rewards such as payment or approval from others (Chatzisarantis & Hagger, 2009; Ryan et al., 2008). Self-efficacy, an individual's confidence in their ability to perform a behaviour to achieve a desired outcome (Bandura & Adams, 1977), has also been shown to mediate health related behaviours (Strecher, Devellis, Becker, & Rosenstock, 1986). The two are not synonymous: an individual might have strong motivation to change a certain behaviour, yet lack confidence in their ability to make a start (Bandura, 1977). Here, we focused on how to best elicit and build motivation and self-efficacy for losing weight and becoming more physically active.

The importance of motivation and self-efficacy are well established in the context of weight management, being associated with both diet and physical activity. Self-efficacy is associated with successful adherence to dietary changes (Dennis & Goldberg, 1996; Dutton et al., 2004; Linde et al., 2006) and weight maintenance (DePue et al., 1995; Elfhag & Rössner, 2005). High baseline self-efficacy has been associated with expending more calories through exercise (King et al., 2010), and trials aimed at increasing physical activity have found that self-efficacy mediates effects of interventions on behaviour (Darker, French, Eves, & Sniehotta, 2010; Sniehotta, 2009). Weight loss trials show relatively small effects of baseline self-efficacy on outcomes (Prochaska, Norcross, Fowler, Follick, & Abrams, 1992) but stronger, positive effects of *change* in diet self-efficacy (Martin, Dutton, & Brantley, 2004), exercise self-efficacy (Byrne, Barry & Petry, (2012), or both (Linde et al., 2006). Motivation also predicts long-term weight loss (Elfhag & Rössner 2005; Silva et al., 2011; Teixeira et al., 2004). For example, Mata et al., (2009) found that general self-determination as well as exercise-specific motivation predicted dietary regulation and physical activity over a 12-month weight loss trial. Self-motivation predicted engagement with and success on a very low calorie weight loss programme over 23 months (Williams et al., 1996) and weight loss outcomes over three years (Silva et al., 2011)

Strategies to strengthen motivation and self-efficacy should therefore form part of interventions for weight loss and weight management. There is an urgent need to improve such interventions, to tackle rising obesity rates and associated diseases such as type 2 diabetes and cardiovascular diseases (Wang, McPherson, Marsh, Gortmaker, & Brown, 2011). It is already known that interventions that target both motivation and self-efficacy, such as Motivational Interviewing (MI; Miller & Rollnick, 2012), are consistently better than traditional advice-giving and other controls in treating health-related and addictive behaviours, including weight management (Armstrong et al., 2011). However, it is not clear

if they achieve these benefits by increasing motivation and self-efficacy. Surprisingly few weight loss trials include measures of self-efficacy and motivation, even when they are testing interventions such as MI that are designed to strengthen them. In a recent meta-analysis of mechanisms of change in MI, no evidence was found that MI or Motivational Enhancement Therapy increased motivation (Romano & Peters, 2015). Only one paper in their review included a measure of self-efficacy (Dean, Touyz, Riger, & Thornton, 2008).

There is a paradox then: motivation and self-efficacy are theorised and demonstrated to be important for behaviour change, yet there is uncertainty about whether one of the most effective strategies for behaviour change – MI– strengthens them. It should do so as that is what it is designed to do, but there is little direct evidence that it does and to what extent. MI's effects on behaviour are often quite small and short-lived. For example, Armstrong et al's. (2011) meta-analysis of MI for weight-loss found only an average advantage of intervention over control group with a reported Weight Mean Difference of 1.47 kg [95% CI -2.05, -0.88]. Only two of the 12 studies assessed change over more than 6 months. These shortcomings could be viewed as reasonable effects of a brief intervention (total dose varied from under one hour to a little over 5 hours) but they suggest targets for improvement: to increase the impact of MI on motivation and self-efficacy and increase the duration of its effects.

FIT should boost motivation further than MI because it uses imagery to amplify the incentives of change. It makes the desired behaviour change more affectively-charged, enhancing motivation to pursue it (Kavanagh, Andrade, May, Connor, 2014). Previous research has demonstrated that using mental imagery when considering positive and negative scenarios fostered higher levels of emotional change than verbal elaboration (Holmes, Mathews, Dalgleish, & Mackintosh, 2006; Holmes, Mathews, Mackintosh, & Dalgleish, 2008; Holmes & Lang, 2009). Imagery has also been found to increase behavioural activation in depression (Renner et al., 2017). Motivation to undertake certain

behaviours, such as health promoting and pro-social behaviours, increases when individuals imagine themselves in those situations (Crisp et al., 2010; Rennie et al., 2014). FIT should also be superior to MI in enhancing self-efficacy because imagining carrying out planned behaviours provides a form of vicarious practice that strengthens it (Bandura, 1989).

Here we compared a) FIT and MI's effectiveness in building motivation and self-efficacy to lose weight, make dietary changes and become more physically active. Because EI theory conceptualises motivation as a state that fluctuates episodically, we measured frequency of motivational cognitions, including imagery, rather than underlying trait motivation (Parham et al., 2016; Robinson et al., 2016). We predicted increases in motivation and self-efficacy from baseline to follow-up at one month, with larger increases for FIT compared with MI. No other predictions were made.

5.2 Results

A total of 141 participants were recruited to the parent weight-loss RTC in the time available (March -May 2016). One hundred and 21 were randomised, 58 to MI and 63 to FIT. Seven participants in total were lost by 1m motivation and self-efficacy follow-up³. Of those 114 participants who were retained by 1m, a total of 111 (33 males, 78 females, M age= 42 years) completed secondary outcome questionnaires for both assessment points, probing their motivation and self-efficacy for losing weight and increasing physical activity. Three participants did not complete the motivation and self-efficacy measures. The 111 participants that were included for analysis in the current study are a subset of the 114 participants included for analyses in studies 4 and 5.

³ Please note that study 4 (the parent RCT of study 3) reports these seven participants as lost to 6m follow-up because we focused on reporting primary RCT outcomes only in study 4.

Table 5. Motivation and self-efficacy at baseline and one-month follow-up after three sessions of motivational interviewing or functional imagery training

Measure	Motivational Interviewing		Functional Imagery Training	
	Baseline	1 month	Baseline	1 month
	M (SD)	M (SD)	M (SD)	M (SD)
<i>Motivation</i>	6.4 (1.52)	7.1 (.89)	6.7(1.91)	8.4 (.69)
<i>Self-efficacy for dietary change</i>	54.4 (13)	81.9 (8.4)	53.6 (17)	89.4 (7.6)
<i>Self-efficacy for physical activity change</i>	2.7 (.41)	3.6 (.38)	2.7 (.56)	3.8 (.21)

Motivational Thought Frequency Scale - Diet and Physical activity (MTF-DP)

A repeated measures ANOVA showed that motivation overall increased across groups from baseline to follow-up (one month), $F(1,109) = 39.7$, $p < .001$, $\eta^2 = .27$ —an effect which in post-hoc tests was seen in each group (MI: $t(53) = -3.0$, $p = .004$; FIT: $t(57) = -6.1$, $p < .001$). There was a significant time x group interaction: $F(1,109) = 5.7$, $p = .02$, $\eta^2 = .05$, reflecting a greater increase in the FIT group than the MI group (Table 5.). Effect size for the difference between the two groups at one month was $d = 1.49$.

Self-efficacy for eating behaviour/dietary changes from baseline to one month.

A repeated measures ANOVA revealed that self-efficacy for dietary change improved across groups from baseline to follow-up $F(1,109) = 395.3$, $p < .001$, $\eta^2 = .78$, which was again seen in each group (MI: $t(51) = -13.0$, $p < .001$; FIT: $t(58) = -15.0$, $p < .001$). However, there was a significant time x group interaction: $F(1,109) = 977.5$, $p = .01$,

$\eta^2=.06$ —again reflecting a greater increase in self-efficacy for dietary changes for FIT than MI (Table 5.). The effect size for the difference between the two groups at one month was $d= .94$.

Self-efficacy changes for physical activity (PA) from baseline to one month follow-up

Results from self-efficacy for physical activity followed the same pattern, with a significant change across groups, $F(1, 109) = 374.3, p < .001, \eta^2=.77$, which reflected a significant change in each group (MI: $t(51) = -12.3, p < .001$; FIT: $t(58) = -15.2, p < .001$). Once again, there was also a significant time by group interaction, $F(1, 109) = 4.3, p = .04, \eta^2=.04$, reflecting a greater improvement in FIT than in MI. The effect size for the difference between the two groups was $d = .72$.

Moderation analysis

Additionally, we investigated (across both groups) whether weight reductions at 6m were larger for those participants who experienced greater changes in self-efficacy for diet from baseline to 1m. This was not the case: Participants who lost more weight did not evidence larger changes in self efficacy. Self-efficacy changes did not moderate total weight-loss ($F = 2.04, p = .16$). We also investigated (across both groups) whether weight reductions at 6m were larger for those participants who experienced greater changes in motivation from baseline to 1m. This was not in fact the case: Changes in motivation did not moderate changes in weight ($F = 1.76, p = .19$).

Lastly, we tested whether changes in self-efficacy for diet and motivation from baseline to 1m were larger for those participants (across both groups) who reported greater frequency of goal-related imagery at 1m, using two subscales taken from the MTF-DP that assess imagery-based incentives and self-efficacy for the combined goal of making changes to one's diet and physical activity levels. We included only the non-imagery items from the MTF-DP for testing motivation in the analysis. Imagery did not

moderate changes in self-efficacy ($p = .41$), or motivation ($p = .41$); greater frequency of goal related imagery was not linked to larger changes in self-efficacy, or motivation.

5.3 Discussion

This study assessed changes in motivation and self-efficacy for making healthy dietary changes and increasing physical activity, from baseline to one month, as part of a RCT comparing the effectiveness of motivational interviewing (MI) and functional imagery training (FIT) on weight loss. Additionally, we conducted some unplanned, post-hoc analysis to investigate a) whether changes in weight at six months were moderated by changes in self-efficacy and motivation at one month and b) if those participants who experienced higher frequency of goal-related imagery, reported increased self-efficacy and motivation changes.

In line with our main hypothesis, two sessions of either FIT or MI and one booster call (maximum total contact: 110 minutes), resulted in increases in self-efficacy for both diet and physical activity. Motivation to be more active and to eat healthily also increased in both groups. For each measure of motivation and self-efficacy, the increase was larger for the FIT group than the MI group.

These findings address the relative dearth of data on the impact of MI on motivation and self-efficacy, showing, in contrast to Romano and Peters's (2015) conclusions, that MI can increase both. Some of the discrepancy in findings may be due to the timescale of measurement. We measured motivation and self-efficacy early on in a 12-month weight loss trial because we reasoned that they would determine whether people translated their intentions into actual changes in behaviour. It is conceivable that motivation and self-efficacy are less closely tied to behaviour once behaviour has become routine than when it is still novel. There is sound evidence that change in self-efficacy predicts weight and physical activity outcomes (Byrne, Barry, & Petry, 2012; Darker et al., 2010; Linde et al., 2006; Martin et al., 2004), and that motivation predicts weight loss (Elfhag & Rössner

2005; Mata et al., 2009; Silva et al., 2011; Teixeira et al., 2004; Williams et al., 1996), but it remains to be shown that changes in self-efficacy and motivation moderate the impact of MI and of FIT. We found no evidence that changes in either self-efficacy or motivation at 1 month were associated with weight loss at 6m. A real weakness of the current study that may have affected these findings is that we had not planned to do this analysis. Subsequently, we had a long delay between the self-efficacy and motivation change measurement points at one month and the weight-loss assessment at six months. By six months, weight loss was conceivably less dependent on motivation and self-efficacy because healthy eating and physical activity had already become habitual. Future studies should include more realistic, or matched timeframes around the assessment of such measures.

The observed increase in motivation and self-efficacy following FIT is consistent with previous research by our group. Andrade et al. (2016) demonstrated similar motivational changes in a stepped wedge trial of FIT. Frequency of motivational thoughts about curbing snacking between meals was higher in the two weeks following a one-hour FIT session than in the two weeks preceding it. Similar results were also obtained in the one-armed pilot study for this trial (chapter 3). In that study, motivation to eat healthily and motivation to be more active were measured from baseline to three months. Motivation reached its highest point after the first two sessions of FIT, and then levelled out, staying high throughout the 3-month FIT-supported period of the 15-month study. The present study showed, for the first time, that FIT is more effective than MI at increasing motivation and self-efficacy. Both interventions are delivered in the goal-orientated, collaborative style of MI (Miller & Rollnick, 2009) targeted at eliciting and supporting motivation and self-efficacy (Armstrong et al., 2011; Rubak et al., 2005), drawing attention to the individual's own incentives. In FIT, motivation is additionally supported by eliciting and routinely rehearsing emotive imagery, about personal goals and the most immediate benefits of

pursuing them, which strengthens desire to achieve the goal (Andrade et al., 2016; Kavanagh et al., 2005). The superior impact of FIT on the frequency of motivational cognitions supports the prediction from EI theory that training multi-sensory goal-related imagery will strengthen functional desires (Kavanagh et al., 2005).

MI and FIT share the aim to build self-efficacy for goal pursuit, goal attainment and overcoming barriers (Miller & Rollnick, 2012; Andrade et al. 2016). Self-efficacy is a core contributor in facilitating goal adherence (Bandura, 1977), especially in health related behaviour change processes (Schwarzer & Renner, 2000). Individuals that are self-efficacious will respond to obstacles – for example, being let down by a gym partner or offered a second helping - with confidence, increased effort and persistence because they know they can do it (Locke & Latham, 2002, 2006; Wood & Bandura, 2014). Part of this effect is due to people with better coping skills having higher self-efficacy, but the effect appears also to be due to people with higher self-efficacy exerting greater effort and showing greater persistence in striving towards their goals (Wood & Bandura, 1989). Finally, high-self efficacy, for the same reasons protects individuals against relapse after brief goal incongruent episodes (e.g., ordering dessert, instead of coffee on a night out) and helps them get back on track towards their original goals (Bandura, 1977; Schwarzer & Renner, 2000). In MI, these aspects are usually addressed via verbal discussion, without placing direct emphasis on personally salient goal-related imagery. Uniquely to FIT, self-efficacy is elicited and nurtured by vivid, imaginal exploration of past successes with behaviour change and rehearsing future scenarios, especially those where barriers obstructing a goal need to be addressed and overcome. This provides a ‘real life’ emulation (Kavanagh et al., 2005; Moulton & Kosslyn, 2009), the opportunity to safely rehearse challenging situations and to indulge in the successful outcome, increasing individual’s belief in their ability to handle adversity. Recent meta-analyses have found that physical activity interventions that included ‘vicarious experience’ and detailed action

planning increased self-efficacy (Ashford, Edmunds, & French, 2010) as well as physical activity (Williams & French, 2011). Imagery provides one form of vicarious experience, and when it incorporates vivid memories of successes (performance accomplishments), provides a particularly powerful source for self-efficacy (Bandura, 1977). The positive affective tone of these memories ('positive emotional arousal') further assists by increasing the availability of other memories of success (Kavanagh & Bower, 1985).

In EI theory, it is assumed that desire imagery relies on limited capacity working memory processes, as do other types of mental imagery (Baddeley & Andrade, 2000). This assumption is supported by evidence that neutral imagery and other cognitive tasks weaken cravings when their sensory modality matches the salient sensory modality of the craving imagery (Kemps & Tiggemann, 2007, 2015; May et al., 2010; Schumacher, Kemps & Tiggemann, 2017). The work in FIT around strengthening goal-related imagery serves not only to strengthen motivation, but also to interfere with counter-productive craving imagery by competing for the same limited capacity resources. If cravings were mentioned as a potential obstacle during a FIT session, the primary researcher would draw attention to the individual's ability to divert their attention deliberately from the craving imagery towards their goal imagery. Knowing that they have strategies in place to help them, outside of the therapy setting, might have boosted FIT participants' self-efficacy even further. Future research should test the prediction that FIT will reduce the frequency and strength of food cravings as well as increase desire for healthy diet and physical activity.

There are limitations to the current study. A key limitation is that even though FIT borrows elements from social cognitive theory (Bandura, 1977), the main theory underpinning it, EI theory, proposes imagery as a clear mechanism by which self-efficacy and motivational cognitions are elicited and built. We did not set out to directly measure if controlled imagery use moderated changes in self-efficacy and motivation. We do not

know that it worked by the mechanisms predicted by EI theory (Kavanagh et al., 2005, May et al. 2014) We conducted an unplanned analysis to test whether imagery moderated changes in self-efficacy and motivation. We found no evidence that those who changed from self-reported low frequency of goal-imagery to higher frequency of goal-imagery (across all participants) experienced any benefit of increased motivation or self-efficacy, compared to those who did not evidence an increase. These findings have to be considered with care for several reasons: A) We did not set out to capture use of controlled imagery. We used proxy measures of imagery; two sub-scales from the MTF-DP that measure frequency of imagery-based incentives and self-efficacy for goal-related cognitions over the past week, making it an inadequate measure of controlled use of imagery; b) the motivation and self-efficacy measures provide a snapshot at one month into the trial, posing a long delay until the six month weight assessment, by which time we would have expected imagery to become more automatic and for other mechanisms, such as habits, to take over and c) the sub-scales we used cannot capture the quality of goal-related imagery cognitions, but only their frequency, so it introduces a conflict between frequency of imagery and actual quality of imagery. Future research will need to establish whether greater use of functional imagery is the mechanism by which self-efficacy and motivation are increased in FIT. Future research might also map how motivation and self-efficacy change during and after active intervention, and how this change relates to the development of new behavioural habits (Lally & Gardner, 2013). It is conceivable that relationships with behaviour change may differ depending on baseline levels of motivation and self-efficacy. There is some evidence that physical activity increases following intervention are mediated by self-efficacy changes in populations without obesity (Williams & French, 2011), but not in those with obesity (Olander et al., 2013). Baseline ratings should be taken into account as well as post-intervention ratings.

In conclusion, we have shown that MI and FIT are effective at increasing motivation and self-efficacy for dietary and physical activity changes, at least in the short term, in individuals with overweight or obesity who want to lose weight. FIT outperformed MI in its ability to increase motivation and self-efficacy, consistent with the central tenet of EI theory that mental imagery is key to desire for functional as well as dysfunctional behaviours (Kavanagh et al., 2005, May et al. 2014). Given the demonstrated importance of self-efficacy and motivation for behaviour change in diverse settings, including condom use (Hendriksen, Pettifor, Lee, Coates & Rees, 2007), medication adherence (Zomahoun et al., 2016), reducing alcohol consumption (Oei & Burrow, 2000; Vasilaki, Hosier, & Cox, 2006) and smoking cessation (Baldwin et al., 2006; Rubak et al., 2005), we predict that FIT will be an effective intervention for motivating a wide range of health related behaviours.

Chapter 6: Functional Imagery Training versus Motivational Interviewing for Weight Loss: A randomised controlled trial of brief individual interventions for overweight and obesity

6.1. Background

So far, we have shown that people welcome the idea of motivational support, and FIT in particular, to help them lose weight (chapter 2). Pilot data suggested that FIT could support substantial and sustained weight loss (chapter 3). Chapter 5 showed that, compared with MI in a weight loss RCT, FIT was associated with greater initial increases in motivation and self-efficacy for healthy eating and physical activity. The present chapter reports the weight-related outcome data from this trial. We recruited members of the public with overweight and obesity to compare the effects of MI and FIT on weight loss over 6 months of low-intensity treatment, and an additional 6 months of follow-up. We predicted that FIT would produce greater initial weight loss and better maintenance at 12 months because FIT teaches the cognitive skills individuals need to stay motivated.

6.2. Results

A total of 141 participants were recruited in the time available (March -May 2016). One hundred and 21 were randomised, 58 to MI and 63 to FIT. One hundred and 14 were included in the primary data analysis of the 6-month follow-up, and of those 112 completed both 6 and 12-month follow-ups (Consort Diagram, figure 5; Table A in the supplementary materials appendix F).⁴ No statistically significant differences were found between groups at baseline (Table 6.). Twenty one out of 58 FIT participants reported having used the app or audio when asked at 6 months. Twenty five out of 55 MI participants had continued to use their goal-sheet past the first MI session when asked at 6 months. In the FIT group, four participants reported having chosen a specific diet as opposed to lifestyle changes only. These diets were: Ketogenic diet, Rosemary Conley (online membership only),

⁴ Please note that a subset of 111 of those 114 participants included in the primary RCT data analyses was included in the secondary data analysis in study 3.

Weight Watchers and Slimming World. In MI, five participants reported they had chosen a specific diet: 5:2, Weight Watchers and Slimming World.

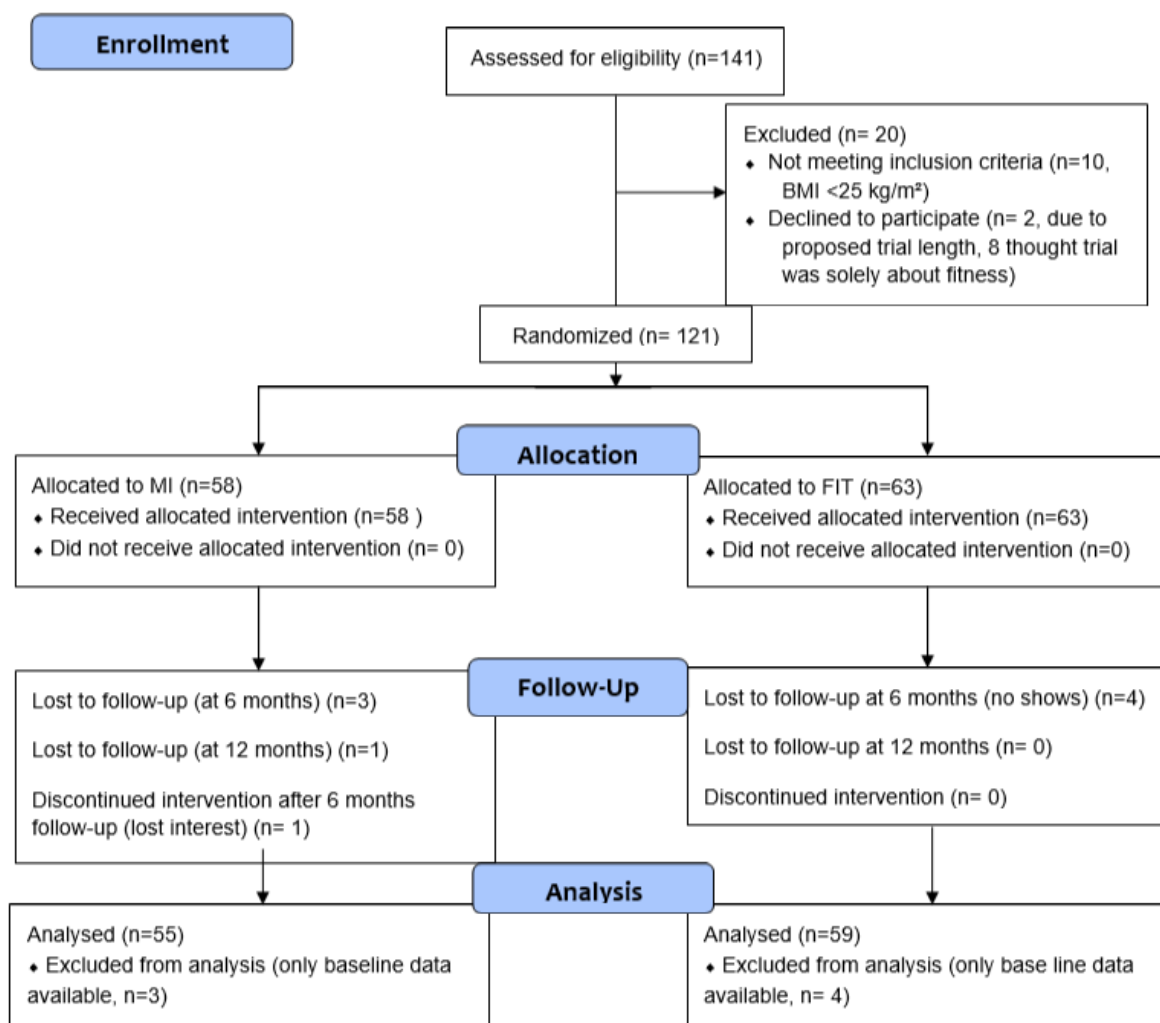
Table 6. Baseline demographics, split by intervention:

Group/condition	MI (Mean, Median, Range)		FIT (Mean, Median, Range)	
N	55		59	
Gender (N)	Female	40	Female	43
	Male	15	Male	16
Age (N years)	Range	19-70	Range	20-72
	Median	43	Median	45
	Mean	42	Mean	45
BMI (kg/m ²)	Range:	24.51-53.33	Range	25.98-47.97
	Median	31.34	Median	31.85
	Mean	32.54	Mean	33.21
Weight (kg)	Range	59-131	Range	62.30-140.5
	Median	87.40	Median	89.40
	Mean	89.66	Mean	91.46
Waistline (cm)	Range	80-148	Range	79-144
	Median	105	Median	103
	Mean	106.01	Mean	106.78
Employment status (N)	Employed full-time	12	Employed full-time	20
	Employed part-time	18	Employed part-time	14
	Retired	5	Retired	6
	In education	4	In education	7
	Unemployed	3	Unemployed	5
	Other	11	Other	4
	Self-employed	1	Self-employed	2
Highest level of education (N)	GCSE	15	GCSE	14
	NVQ/Diploma	4	NVQ/Diploma	5
	Trade	8	Trade	6
	A or O-Levels	14	A or O-Levels	15
	Access course	2	Access course	4
	Foundation degree	2	Foundation degree	1
	Undergraduate degree	4	Undergraduate degree	3
	Postgraduate degree	1	Postgraduate degree	4
	No info given	4	No info given	5

There were no statistically significant differences found between groups at baseline.

MI and FIT fidelity checks

MI skills were rated on the MITI's (44) 5-point scale: 1: Never, 2: Rarely, 3: Sometimes, 4: Often, 5: Always. For MI, ratings for Evocation, Collaboration, Autonomy, Support, Direction, and Empathy ranged from 3.9 to 4.9 (median=4.5). For FIT, they ranged from 3.8-4.7 (median =4.5). For FIT, 15 session elements were rated as 0 absent, or 1 present. Totals ranged from 13-15 (median = 15). Independent raters correctly assigned 100% of audio recordings to intervention.

Figure 5. Consort Flow diagram

Primary analysis

To visualise changes in weight and waist, we plotted unadjusted means and 95% confidence intervals for each group. Figure 11. indicates that participants treated with MI experienced little to no reduction in weight or waist from baseline to either 6 or 12-month follow-ups. Those treated with FIT experienced large reductions in weight and waist circumference. Relative to both the MI group and baseline, participants treated with FIT continued to lose weight after treatment ended.

Figure 6. Unadjusted weight and waist circumference by group: Mean and 95% confidence interval.

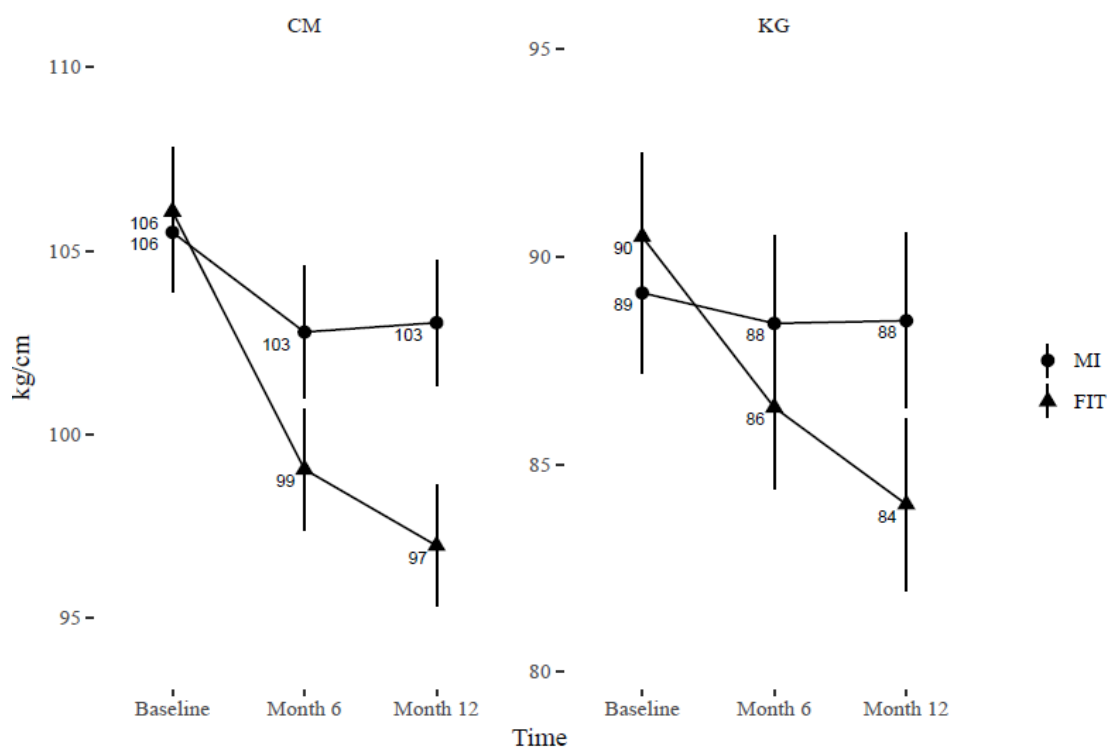


Figure 1: Unadjusted weight and waist circumference by group: mean and 95% confidence interval.

Our primary statistical models estimated the differences between-groups, conditional on baseline BMI, at month 6 and 12; results are presented in Table 7. We found substantial and statistically significant differences between the MI and FIT groups at both follow-ups.

To make probability statements about the size of benefit obtained by participants undergoing FIT, we re-estimated our mixed models using a Bayesian procedure. Table 7. shows treatment effects and associated 95% credible intervals from these models.

Table 7. Between group contrasts (with Satterthwaite corrected degrees of freedom for Kg and Cm) and posterior mean differences (and 95% credible intervals) for the effect of FIT vs. MI at month 6 and 12. MCMC = Markov Chain Monte Carlo estimates from Bayesian model fits.

Outcome	Follow up	FIT (mean)	FIT (sd)	MI (mean)	MI (sd)	df	t	p	Treatment effect (MCMC)	lower	upper
Cm	Baseline	106.07	13.75	105.50	12.51						
Cm	Month 6	99.05	12.61	102.78	13.37	205.4	-4.727	<.001	-4.444	-6.328	-2.560
Cm	Month 12	96.97	12.59	103.04	12.45	206.1	-7.012	<.001	-6.697	-8.602	-4.801
Kg	Baseline	90.48	15.90	89.13	14.76						
Kg	Month 6	86.37	15.07	88.39	15.72	161.5	-4.877	<.001	-3.670	-5.203	-2.139
Kg	Month 12	84.04	15.96	88.46	15.34	163.4	-7.707	<.001	-5.929	-7.482	-4.418
GQOL	Baseline	62.13	10.59	61.71	14.51						
GQOL	Month 6	75.81	11.66	72.53	10.42	109.0	2.107	.037	2.831	0.091	5.565

Cm=waist circumference in cm, kg=mean weight in kg, GQOL=mean score of Global Quality of Life assessment

MCMC: Markov Chain Monte Carlo estimates from Bayesian model fits.

For weight and waist circumference, there was overwhelming evidence that FIT was beneficial. Similarly, for GQOL the difference between groups at month 6 was statistically significant.

Sub-group analysis men

We additionally examined interactions between treatment and gender on weight-loss outcomes. We ran our model again, with gender included. The results were inconclusive because there were too few men. There was a suggestion that women might lose more weight at 6m (M weight change FIT= -5.56, SD FIT= 4.07; M weight change MI= -1.23, SD MI= 2.18) compared to men at 6m (M weight change FIT= -3.84, SD FIT= 4.34; M weight change MI= -1.37, SD MI= 1.75), but these weight changes were not statistically significant: A chi-squared test for comparing models including or not including gender showed $\text{Chisq}(8) = 9.05$, $p = 0.34$. Including gender in the model does not improve the fit of the model to the data.

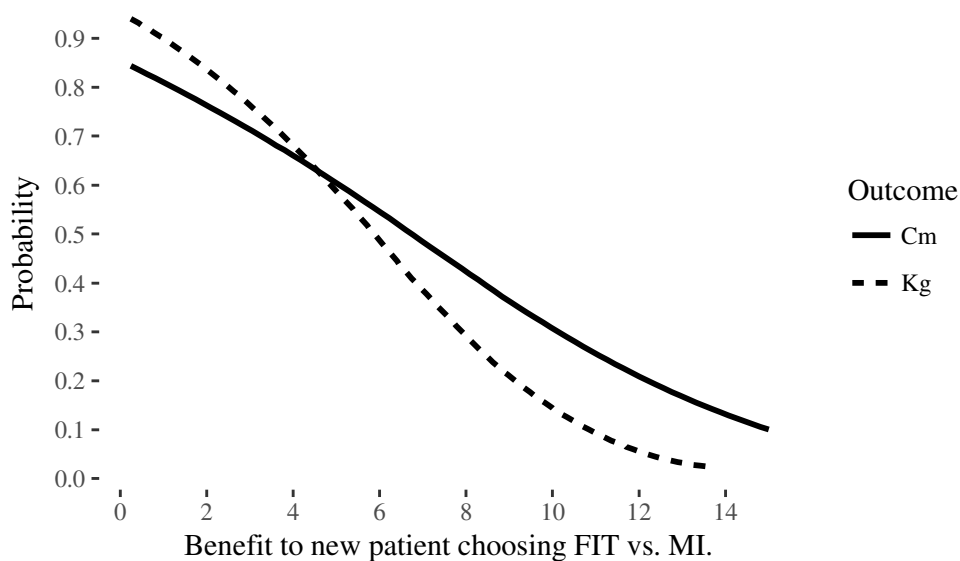
Participants' recommendations

In the FIT group, 58/59 participants would recommend the intervention to others; one might recommend. In MI, 53/55 would recommend, 2 might.

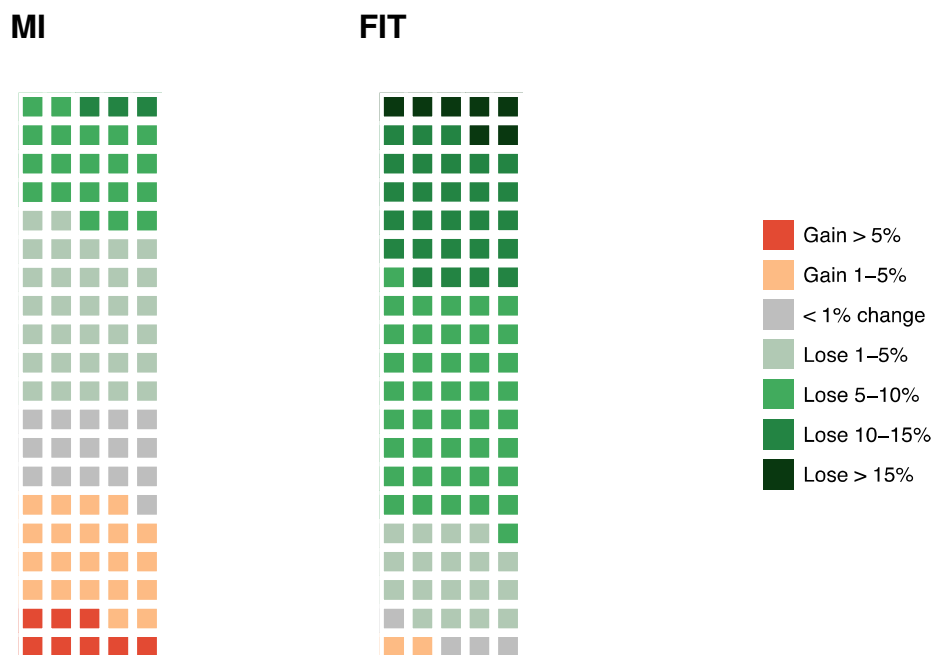
Estimating clinical benefit

To help clinicians and others evaluate the likely benefit of FIT in clinical practice, we computed the posterior-probability that the benefit of FIT for a new participant would exceed a range of values between 0 and 15kg lost, and between 0-15cm of waist reduction (Figure 7.).

Figure 7. Prognosis for new participants randomised to FIT vs. MI, expressed as the probability the benefit will equal or exceed the value on the x-axis.



When considering the risks or benefits of interventions, clinicians, participants and researchers benefit from probability information presented as 'natural frequencies' or in 'pictographs' (Tait, Voepel-Lewis, Zikmund-Fisher, & Fagerlin, 2010). Consequently, we used the same model-based simulations to calculate the range of likely prognoses from the participants' perspective (Figure 8.). After treatment, only 22% of MI participants were predicted to lose 5% or more of their initial weight, compared with the NICE target (NICE, 2017b) that 30% do; after 12 months this figure was 23%. In contrast, 54% of new FIT participants were predicted to lose at least 5% of their initial weight after treatment, and 75% are predicted to lose this much by 12-months. Stated differently, nine of every 10 participants would have benefitted more from FIT than from MI (probability $FIT > MI$ for kg lost at 12m = 0.94; for cm lost it is 0.85); for half of these participants, the expected additional benefit is substantial (> 5kg difference in projected outcomes, see data supplement).

Figure 8. 12 month prognosis for 100 new participants undergoing MI or FIT.

Economic assessment

We based our inputs to the PHE assessment tool (Copley, 2016) on the conservative assumption that MI was equivalent to no-treatment, and that FIT participants would begin to gain weight immediately after the 12-month follow-up. We modelled costs on the basis that 58 new patients would be treated with FIT and that they would reduce their BMI by an average of 2.148 kg/m² over 1 year (based on our primary outcome models). We very conservatively assumed that each hour of individual treatment would cost £250 to deliver, and entered a worst-case per-participant cost for FIT at £1000.

Even based on these highly conservative assumptions, the PHE model suggests that FIT would be cost-effective from the healthcare perspective within three years, judged by NICE's conventional willingness-to-pay threshold of between £20,000 and £30,000 per QALY. Cost-per-QALY after three years was £22,036, falling to £12,363 after five years, and £7,229 after 10 years. Including costs of social care and the prospect of increased

employment, cost per QALY was only £12,968 after three years, £3,739 after 5 years, and was cost-saving from a 10-year perspective.

6.3. Discussion

In this first randomised controlled trial of FIT, we have shown that two FIT interviews and nine brief booster phone calls, amounting to under 4 hours of therapist contact over six months, resulted in substantially greater and clinically meaningful weight loss and waistline reductions at six months, compared with MI. Participants in the FIT arm, but not MI, continued to lose weight and waist circumference in the unsupported 6-month maintenance phase. Participants in both treatment groups reported improved quality of life at 6 months, but FIT participants reported greater improvements. Seventy-one percent of the FIT group lost more than 5% of their initial weight, easily exceeding the NICE weight management target that at least 30% of service-users should do so (NICE, 2017a). MI did not meet the NICE target, with only 23% losing 5%.

Importantly, we found that FIT was acceptable to participants and that they would recommend FIT to a family member, friend or colleague. Because the delivery of FIT closely matches the protocol of an existing intervention (MI), scaling delivery to larger numbers of participants should be straightforward, with existing MI practitioners requiring only minimal additional training.

To put these findings into a broader context, FIT performed favourably compared to a longer, more intensive intervention in a recent UK trial: Ahern and colleagues (Ahern et al., 2017) tested weight loss in participants with overweight and obesity referred by GPs to Weight Watchers. Participants randomised to the Weight Watchers programme for 12 months had lost an average of 6.8kg at 12 months, only 0.4 kg more than participants in our RCT, who received less than 4 hours of FIT spread over 6 months. Participants on the standard 12-week Weight Watchers programme lost less than FIT participants in this study: only 4.8kg on average (Ahern et al., 2017).

The approach tested in this trial, of providing solely motivational support, differs from the strategy recommended by Public Health England (NICE, 2017b; Thompson, Aveyard, Jebb, Blackshaw, & Coulton, 2017) of combining behaviour change techniques with lifestyle education and advice. NICE recommends including MI and imagery in behaviour change strategies. FIT combines both in a coherent, structured intervention that trains users to become their own therapist; the present results support this approach. It remains to be determined if combining FIT with diet and physical activity education would generate superior outcomes.

Sustained reductions of around 5% of body weight can effect significant health improvements, such as decreased blood lipids, precursors of Type 2 diabetes and improved blood pressure (Donnelly et al., 2009; Jakicic et al., 2001). Weight loss of between 5% and 10% is associated with significant improvements in cardiovascular disease risk factors (Wing et al., 2011). The reduction in waist circumference, from an average of 106 cm to 97 cm by 12 months in FIT, brings its own health risk reductions: excess abdominal fat indicated by a high waist circumference in men (>102 cm), presents a fivefold increase in the risk of developing diabetes (Gatineau, Hancock, Holman, Outhwaite, Oldridge, 2014). For women, across a range of baseline BMIs between 25-50 kg/m², waist reduction of 5-10cm is associated with a reduction in cholesterol and systolic blood pressure (Han, Richmond, Avenell, & Lean, 1997). Results from the Public Health England economic assessment tool suggest that these health benefits would make delivery of FIT cost effective, although detailed cost-effectiveness evaluation must form part of additional large-scale evaluations of FIT.

The fact that FIT outperformed the best established motivational intervention by such a margin is encouraging. We demonstrated a mean weight difference of 2kg for FIT, compared with the active MI intervention group at 6 months. This benefit of FIT over MI was larger than the benefit of MI over minimal control interventions in Armstrong et al's.

(2011), meta-analysis of MI for weight loss: mean difference = 1.47 kg 95% CI = -2.05 to -0.88 at around 6 months. However, we note that weight in the MI group stabilised after six months, and successfully preventing weight gain is an important health focus (Lloyd-Jones et al., 2007; Strong, Parks, Anderson, Winett, & Davy, 2008). That FIT demonstrates such an improvement over an existing treatment, and produces continued weight loss after the end of the intervention period, highlights the benefit of developing and adapting existing interventions based on recent developments in cognitive science.

Limitations

As far as possible, we matched MI and FIT for intervention intensity. There were the same number of sessions, scheduled for the same duration, in both conditions. Although the dialogue for FIT incorporated the same essential components as for MI, we added some extra elements to the MI manual to add depth to the interview and equate the time taken. In FIT, all participants were offered the Goal in Mind app to guide their imagery practice. In MI, all participants were given goal sheets to review at home. If anything, MI participants had more time to talk to the therapist because they did not do imagery exercises.

FIT achieved larger effect sizes than expected. Because of practical constraints on recruitment, our sample was smaller than that recommended by our power calculations to detect modest to moderate effect sizes, therefore it is plausible that our trial over-estimates the true effect of FIT, i.e. a 'Type M' (magnitude) error (Gelman & Carlin, 2014).

Nonetheless, the posterior probability for an effect of FIT < 1kg lost was extremely low, and the evidence that FIT was preferable to MI was substantial.

Another limitation was that we had few men in both treatment groups, 33% in FIT and 27% in MI. We cannot say if motivational interventions work differently for men or women, given our sample. We do assume that motivational cognitive interventions, like FIT and MI work in similar ways for both genders. We do know from qualitative research

for example that men struggle with motivation to lose weight much in the same way women do. In Sabinsky et al. (2007) Danish working men described lack of motivation as one of two main barriers to losing weight and getting fit. Future research should focus on including more men in weight-loss trials of cognitive and behavioural interventions to test whether there are differences in how men and women engage and respond.

The study is also limited by the fact that we use an opportunistic sample and may therefore have missed traditionally hard to reach participants from areas of deprivation who are at particularly high risk of ill health including obesity (Mackenbach et al., 2008). A single therapist delivered the interventions. This provides consistency but also risk of bias – though the fidelity assessments did not flag any problems with MI deliver relative to FIT – and risk that FIT only gives superior results when delivered by particular therapists.

This was the first efficacy trial of FIT for weight loss, and our results must be replicated in a larger multi-centre trial to be confident that FIT can be delivered effectively at scale by other therapists. Findings need replicating with samples that are ethnically and socially diverse with a more representative gender balance. However, we have achieved proof of concept, and compared the intervention with a well-established intervention for weight loss. Although the FIT group maintained their weight loss at our 12- month follow-up, further trials should follow participants for several years to ensure that FIT does indeed help participants maintain the weight loss achieved during treatment, and to properly assess the health economic benefit of these reductions.

6.4. Conclusion

Less than 4 hours of Functional Imagery Training, a novel intervention that combines motivational interviewing with mental imagery training, led to substantially greater weight loss over 6 months than MI alone, despite the fact that specific education on lifestyle and activity was absent from this intervention. The benefits of FIT persisted to

12 months; participants continued to make substantial reductions in weight even after therapy ended.

Chapter 7: Functional Imagery Training and Motivational Interviewing: A Qualitative Investigation of Motivational Interventions for Weight-loss

In this chapter we report participants' qualitative weight loss experiences from the RCT (chapter 6).

7.1. Background

Motivation and low self-efficacy are frequently recurring themes as key enablers and barriers respectively to successful weight management, amongst individuals enrolled in weight-loss trials and during weight-loss maintenance phases once treatment has ceased (Greaves et al., 2017; Hardcastle & Hagger, 2011; Herriot, Thomas, Hart, Warren, & Truby, 2008; Sharifi et al., 2013). Individuals trying to control weight on their own, outside of clinical trial settings, describe the same issues (Solbrig et al., 2017). Well established strategies to strengthen motivation and self-efficacy, such as Motivational Interviewing (MI; Miller & Rollnick, 2012), are consistently better than traditional advice-giving and other minimal controls in weight management (Armstrong et al., 2011). However, motivational approaches in weight-loss are far from being routinely implemented in commercial, community, or primary care and there is little qualitative data on how individuals perceive them during weight-loss attempts. It is therefore crucial to closely examine understanding of how motivational interventions are experienced, a) to help adults with overweight/obesity adopt and maintain lifestyle changes, b) to increase retention in weight-loss programmes and c) to prevent weight re-gain, as commonly experienced after an intervention ceases (Bessesen, 2006).

We ran the first randomised controlled trial (RCT) comparing FIT with MI for weight loss. Interventions were matched for therapist contact time and comprised a maximum of 4hrs contact, 1 hour face-to-face and 3hrs by telephone, over 6 months (Solbrig et al., 2018). We solely provided motivational support in both interventions, differing considerably from the widely adopted strategy recommended by Public Health England (NICE, 2017b),

of combining behaviour change techniques with lifestyle education/advice. Participants in the MI arm lost an average of .75kg at 6m and had not regained weight when assessed at 12m. As predicted, FIT had benefits over MI: participants lost 4.1kg by 6m and a further 2kg by 12m. Weight loss in FIT compared favourably with more extensive lifestyle interventions (Ahern et al., 2017).

The present study assessed participants' experiences of receiving FIT or MI in that trial, collecting qualitative data at 6m, when the active intervention ended. Previous studies of weight loss experiences have found that participants feel resistant towards diet education and advice. For example, in a trial of commercial weight loss programmes, participants perceived some prescribed dietary strategies as extreme, and said they were not likely to continue using them in the future (Herriot et al., 2008). Hardcastle and Hagger (2011), tested an MI intervention for physical activity and dietary. When dietitian MI fidelity was low, participants expressed resistance to prescribed advice and were dismayed over not having been asked about what they themselves wanted to do, making them less likely to adopt advice. We used an inductive approach, and therefore did not develop specific hypotheses. However, in the light of previous findings, we expect MI and FIT to boost self-efficacy and self-determined motivation (Miller & Rollnick, 2012; Solbrig, Kavanagh, et al., 2018) because the practitioner works collaboratively with participants on their self-chosen behavioural goals.

7.2. Method

Please see overview of methods (chapter 4) for RCT method details on primary and secondary outcomes. Here, I will only describe the transcript analysis procedure for the qualitative RCT data.

Transcript analysis

The transcript was coded by the lead and second author, independently, as the first step to becoming immersed in the data (Bird, 2005). The transcript analysis was guided by

a 6-step theoretical thematic analysis outlined by Braun and Clarke (Braun & Clarke, 2006). Data interpretation was data-driven, within a realist approach, in the sense that the researcher was specifically attuned to participants' views, meanings and experiences of weight loss (Braun & Clarke, 2006). This process consisted of the following steps: 1) Reading the transcript repeatedly and noting down initial ideas; 2) coding as many themes as possible, systematically, across the entire data set; 3) searching for and ordering codes into potential themes; 4) checking and reviewing themes against their coded extracts and the complete data set; 5) developing clear definitions and names for each theme, while refining and defining subthemes and the overall narrative the data analysis provides; 6) final review of data analysis and data write-up. To ease the coding and sorting of emerging themes and subthemes, the researchers used several colour codes, stickers and shapes on printed versions of the original transcript, for the entire set of responses from all participants. Each researcher applied the analysis on each group separately and independently at first and then tried to identify commonalities and differences of themes between the two intervention groups. Then both researchers agreed the final set of themes for the whole data set together. They sampled the transcript and checked and compared allocation of excerpts to subthemes. When discrepancies occurred, they were resolved through discussion, until agreement was reached.

7.3. Results

A total of 121 participants were randomised to either FIT or MI in the parent RCT (see chapter 4 for complete overview of methods). Out of those 121 participants, 114 completed the participant experience questionnaire at the 6 months weigh-in appointment (55 in the MI group and 59 in the FIT group) which marked the end of the active RCT intervention period. There were 31 males and 83 females, with ages ranging from 19 to 72 years (Mean=44). These 114 participants were included in the qualitative analysis. They also provided primary outcome data for the RCT reported in Chapter 6.

Ten main themes emerged from the transcripts, comprising 50 subthemes (Table 8.). Five themes were shared across MI and FIT; three were unique to MI and one was unique to FIT.

Thematic data saturation

We applied our code to all transcripts first. Then we checked data saturation retrospectively. Data saturation was achieved within the first 25 randomly selected participants in the FIT group and within the first randomly selected 23 in the MI group. At this stage answers were very similar, repetitive and no new themes emerged (Fusch & Ness, 2015; Guest, Bunce, & Johnson, 2006).

Table 8. Major themes and sub-themes for MI and FIT groups

	MI		FIT
Main Theme	Sub-theme	Main Theme	Sub-theme
1.Diet vs Lifestyle change	1.1Lifestyle changes	1.Diet vs Lifestyle change	1.1Lifestyle Changes
	1.2Diets are restrictive		1.3 Diets are boring
	1.4 Criticism of commercial weight-loss programmes		1.4 Criticism of commercial weight-loss programmes
2.Past vs Current attempts	2.1 Increased motivation	2.Past vs Current attempts	2.1 Increased motivation
			2.2 motivation (and imagery) empowers and makes change easier
	2.3 Autonomy for change values		2.3 Autonomy for change values
	2.4 No prescribed diet, or physical activity regime		2.4 No prescribed diet, or physical activity regime
	2.5 Goals more desired because they are self-set/in-tune with participants		2.5 Goals are more desired because they are self-set/in-tune with participants
	2.6 More thought for food		2.7 Self-compassion, banning guilt
			2.8 No judgement, or social pressure felt

3.Improvements outside of weight loss	3.1 More time with family	3.Improvements outside of weight loss	3.1 More time with family
	3.2 Sleep, energy and fitness		3.2 Sleep, energy and fitness
	3.3 Mood		3.3 Mood
	3.4 Family dynamics		3.4 Family dynamics
	3.5 Increased health in general		3.5 Increased health in general
	3.6 Hormonal symptoms improved		3.6 Hormonal symptoms improved
	3.7 More focused on diabetes management		3.8 Mental Stability through exercise
	3.9 Resilience		3.10 Impulsive eating
4.Support	4.1 Therapeutic alliance	4.Support	4.1 Therapeutic alliance
	4.2 Solving problems and planning together		4.3 Imagery support
	4.4 Dependence on therapist		
	4.5 Positivity from therapist appreciated		4.5 Positivity from therapist appreciated
	4.6 Goals to be set by therapist		
	4.7 Talk therapies not tangible enough to increase motivation		
	4.8 Booster calls help to keep on track, staying motivated		4.8 Booster calls help to keeping on track, staying motivated
	4.9 Appreciated weekend and evening calls		
			4.10 Audios for new goals, reflection and getting back on track
			4.11 Audios appreciated as aid during stress

5.Maintenance	5.1 Slow beginnings/ slow progress and more support wanted	5.Maintenance	5.2 More support to learn imagery
	5.3 Fear of relapse		5.4 No fear of relapse
	5.5 Future oriented thinking		5.6 Mind-set change
			5.7 Plateau exercise
6.Barriers	6.1 Overcoming barriers	7. Imagery	7.1 Emotions
	6.2 Costs of exercise		7.2 Imagery in general
	6.3 External locus of control		7.3 An adaptable skill
			7.4 A cognitive habit
8.Goal setting and action plans	8.1 Motivation and Maintenance 8.2 Wished for extended self- monitoring 8.3 Quickly forgotten		
9.Continued Phone support			

Theme 1: Diet versus Lifestyle change

When we asked ‘**Did you follow a named diet? If so which one?**’, participants in both groups said they made **1.1 lifestyle changes**: ‘No, snacked less and worked on cutting down portions by using smaller plates! Tried to walk a bit more when the weather allowed it.’(P33, MI). Some said **1.2 diets were boring**: ‘I focused much more on getting fit, with swimming than boring diets.’(P61, MI). Particularly in the FIT group, participants noted that **1. 3 diets are restrictive**: ‘Now I can do it because I don’t restrict myself to a diet that is forced on me.’(P42, FIT).

A difference that stood out was that participants in the FIT group sometimes reported big changes that extended to other areas of their lives, generally gave more detailed answers, and used a more enthusiastic tone: *‘I have changed my life completely. I*

did not go on a diet; I just started running and it gives me mental stability to make better decisions. I have rented out my shop and taken on a consultancy role in another firm... and in two days I am doing a 10km run for charity. I run three miles before work every day and I have reduced my drinking and snacking to very minimal amounts.'(P21)

1.4 criticism of commercial weight-loss programmes, was a subtheme which emerged in both groups frequently.

'...not going to weigh-ins because it is completely crazy to sit there listening to people talk about what they ate all week and being told off in front of all. That is maybe motivating for two weeks, but then just gets annoying.'(P10, MI)

'...being told off in front of others and having people try to sell you these wrong sweetened foods was worthless. (P33, FIT)

Theme 2: Past versus current attempts

When we asked groups: **'Have you tried to lose weight and get more active before? If so, how has this time been different?'**, nearly all participants spontaneously described **2.1 increased motivation**. Some **MI** participants used their new motivation to seek help in online support, or group support, but many felt motivated to try on their own.

'I feel like I make more of being a Slimming World member, just online though...it is much better.' (P42)

'I was motivated enough to seek a support group in Weight Watchers.'(P7)

'I felt more motivated to try on my own this time.'(P24)

In **FIT**, participants focused more on describing how **2.2 motivation (and imagery) empowers and makes change easier**: *'I have just come out of a very serious health condition and I felt powerless, but with the positivity from the visualisation, I now feel more motivated, empowered and my energy is returning.'*(P5)

'It was so much easier and I felt less bothered about changing.'(P34)

The majority of participants in both groups expressed unprompted that they **2.3 valued autonomy for change**

'This time I was happy to do it for myself.'(P61, MI)

'I have control in a good way, not the sort of pointing the finger guilty way.'(P6, FIT)

Participants commented positively on having **2.4 no prescribed diet, or physical activity regime**. This sub-theme shared similarities with 2.3 valued autonomy for change:

'Diets are very disheartening...now I feel I'm a bit more free to find my own way with this.'(P19, MI)

'My heart's more in this time, maybe it is because it is up to me to get on with it, not others, telling me what I can and can't have.'(P8, MI)

'The study did not generally offer much advice which was ok. It was good having to find it myself and being empowered.'(P27, FIT)

'...I always give up and regain. Now it is different. I am my own boss, so to speak and I take charge of my life.'(P6, FIT)

In **FIT** only, several participants commented that there is a lot of publicly available free advice but no motivational support to act upon it.

'...was allowed to get on with what I thought would be beneficial and not feel like I wasn't doing enough...there is too much advice out there and not enough support.'(P41)

sub-theme closely linked to **2.4** was **2.5 goals are more desired because they are self-set/in-tune with participants**. Nearly all **MI** and **FIT** participants expressed that they now felt better supported in their self-chosen pursuits, making those more desirable.

'I wanted my goals more this time, I was more ready to commit and it did not feel so hard to make the changes.'(P32, FIT)

In **FIT**, many participants additionally said spontaneously that trying scenarios out in imagery first made them enthusiastic in their goal-pursuits: *'I decide what I want to do,*

what fits. I am more motivated to achieve my goals because I look at things in my mind and see if they fit and if they do...I can go for it with enthusiasm.'(P44)

2.6 More thought for food was a sub-theme mentioned only in MI.: *'I am a bit more mindful this time, I look at what I buy and eat now. This is a big step for me.'*(P53).

2.7 Self-compassion, banning guilt was a sub-theme that emerged exclusively amongst the **FIT** group. About a third of participants felt they had previously struggled with feeling guilty and getting angry at themselves for not keeping to goals or diets. FIT seemed to help reduce guilt.

'I am more stable; I used to be really up and down and I am now not feeling guilty when I've had a bad day. I just start over the next day without guilt.'(P21)

'That was the imagery...seeing things in a different light sometimes, being kinder to myself.'(P9)

2.8 No judgement, or social pressure, was a sub-theme that occurred spontaneously in **FIT**, outside of **4. Support** main theme, where it is mentioned by **MI** participants also. Several participants valued that they were not judged, but supported in a collaborative environment: *'Friendly, non-judgmental approach...'*(P55, FIT)

'Losing weight my way and being supported no matter what.'(P21, FIT)

Theme 3: Improvements outside of weight-loss

Both groups mentioned several improvements outside of losing weight. A strong sub-theme addressed in both groups, by several participants was **3.1 More time with family**: *'Generally my mood is better and I do more with my family.'*(P31, MI); *'I feel so much less out of breath and I can play more with my daughter, spend more quality time...'*(P55, FIT). A closely related sub-theme was **3.2 Sleep, energy and fitness**. All but one participant noted improvements and some said they felt happier than before: *'I am much more energetic which probably stems from my improved sleeping patterns.'*(P32, MI); *'I feel really more fitter. I am happier too.'*(P9, MI).

Closely linked with **3.2**, participants in both conditions reported improved **3.3 Mood**: *'My swimming has really improved my mood.'* (P11, MI), *'...I am motivated by all the possibilities I had not yet considered, especially not since I suffer from depression and I find it hard sometimes to find anything positive in my day.'* (P51, FIT). Some FIT participants directly attributed improved mood to imagery: *'...mood has really improved with all the positive thoughts and images in my head...'* (P55, FIT). Improved mood was related to better **3.4 family dynamics**: *'My family and I became very supportive of each other which changed the mood inside the house. There was less stress...'* (P8, MI). In **FIT**, some participants additionally described how they had to learn to sometimes prioritise their own needs and how this changed the dynamics in the home in a positive way: *'I have tried with some success to put my own needs before the demands of others, which was very difficult for me. And I now realise that the other family members benefit from me doing that, there is a better spirit in the family.'* (P27).

3.5 Increased health in general, was mentioned frequently and with some detail by many FIT participants and somewhat less often and more generally in MI: *'I feel healthier even though I have not lost much weight.'* (P41, MI); *'My liver values have massively improved.'* (P61, FIT); *'...acid reflux now requires no more daily medication...'* (P4, FIT). Two participants in MI experienced no change: *'...I have stayed the same...'* (P9). Specific health subthemes were 3.6 hormonal symptoms improved: *'My menopausal symptoms have really improved, especially through the exercise.'* (P55 FIT) and 3.7 more focused on diabetes management: *'I am more aware of food labels and the urgency to keep this up because of my type 2 diabetes diagnosis.'* (P23, MI)

3.8 Mental stability was a strong sub-theme in **FIT**: *'I have been going to many fitness classes which help me stay on track mentally...I am stronger of mind.'* (P13); *'I am more stable, I used to really be up and down.'* (P37). In **MI** a few participants described a similar change as being **3.9 more resilient**: *'I feel quite a bit more resilient.'* (P60).

Exclusively to **FIT**, two participants specifically mentioned that FIT had helped with

3.10 Impulsive eating: *'I feel this has helped me with my uncontrolled impulsive eating.'*(P16)

Theme 4: Support

When we asked all participants: **'What did you like the most about the programme and why?'**, many participants praised the support they had received. One sub-theme that frequently occurred was that of **4.1 therapeutic alliance**. *'I really felt I was in a positive and well-supported environment and it made the hard work more fun.'*(P17, MI), *'...and this time someone who cares is there to listen.'*(P31, MI), *'...positive support input, never judgemental when things haven't gone well.'*(P9, FIT). In **MI**, a sub-theme closely related to therapeutic alliance evolved: **4.2 solving problems and planning together**. The majority of participants wrote something about how they valued working through issues with their therapist/psychologist, although we never labelled the person delivering MI and FIT as such: *'I liked that we formulated a plan I could stick to...the genuine support and room to discuss issues with a psychologist.'*(P43). Participants in FIT often spontaneously mentioned **4.3 Imagery support** when asked what they liked most about the programme. Their responses suggest considerable enthusiasm, and appreciation for imagery: *'...it made me understand that I am my own boss and I can achieve what I want with a little imagination!'*(P55); *'...the fact that I learned to use a tool like imagery.'*(P5; *'The positive and sustainable ways in which I have been taught to approach weight loss with using the visualisations was the best thing.'*(P58)

Several related sub-themes in **MI** alone suggested a dependence on the therapist, thus **4.4 dependence on the therapist**: *'More counselling contact would have helped to lose more weight I am sure. I am also a bit sceptical about the future. I feel positive now, but not having xxx to talk to will be a real challenge for me.'* (P15); *'If I had support for a*

year I think I would feel more at ease... I feel like it is too early to do everything on my own' (P17).

Participants appreciated the **4.5 positivity from the therapist**. In **MI**, participants tended to attribute positivity to the therapist whereas comments in **FIT** suggest they also saw it as part of the intervention: *'Just really great to have someone there to listen and always put everything into a positive light, will need to learn to do this for myself eventually!'*(P6); *'I appreciated the positive encouragements I received and the encouragement to see each day as a new start, to be nice to myself about it, when things where not going as well as I hoped.'*(P36, FIT); *'The positivity at the heart of it all was infectious.'*(P55, FIT); *'The good support, no lectures, just positive talk and visualisations.'*(P2; FIT).

Only in the MI group, there was a desire for **4.6 goals to be set by the therapist** *'I need stricter support. I need someone to tell me off, sorry xxx! And someone to tell me to set higher standards.'*(P26); *'I wonder whether it would have helped me if my goals had been more ambitious and/or there'd been more goal-setting by the mentor.'* (P8). A few participants stated that **4.7 talk therapies were not tangible enough to increase motivation**: *'I'm not easily motivated so talking about goals and plans doesn't really achieve anything for me.'*(P44); *'Talking does not work for me, competition and structured diet would.'*(P12). None of these 'dependence' themes emerged from the FIT participants.

4.8 Booster calls help to keep on track, staying motivated was a popular sub-theme that emerged in both intervention groups. Nearly all participants found them to be helpful and motivating: *'My experience of the programme was that I was driving my own weight-loss and the calls helped to remind me to stay motivated.'*(P25, MI); *'Regular talks kept me on track and helped me not give in even if I put on weight.'*(P11, FIT); *'...calls really remind you to get started and going...'*(P32, FIT). In **MI** a few participants specifically said they **4.9 appreciated weekend and evening calls** and that this was a must for any

weight loss programme: *'it was great that xxx fit them around what worked for me and I would say that these things should always have evening and weekend help available because many people work and have no time, or are not allowed to take calls at work, like nurses and so on.'*(P35)

FIT participants frequently mentioned how much they liked the neutral guided imagery audio file they were emailed. They gave specific examples of how they used them

4.10 Audios for new goals, reflection and getting back on track:

'The audio file is brilliant...having the audio for reflection and planning new goals...'(P17)

'The audio is very helpful after a bit of a bad day – to get back on the horse easily.'(P32)

'The issue is forgetting to practise imagery sometimes...the audio exercise is great to get back on track...'(P29)

A few **FIT** participants specifically mentioned how **4.11 Audios were appreciated as aid during stress:**

'When I am really stressed at work...use the audio to help me re-focus and I usually can find a way to still work on my goal...'(P43)

Theme 5: Maintenance

When we asked both groups, **'What was not so helpful about the programme and how we might improve?'**, the first main theme that emerged spontaneously was that of **5. maintenance** of weight-loss and physical activity. Many **MI** participants mentioned they had **5.1 slow beginnings/experienced slow progress and wanted more support** because of this: *'I need longer and more calls because I am only now getting started with working on myself and spending more time on this, on me. It took a while to get into the mood.'*(P60). One participant in **MI** said however that the support calls were a waste of

time: *'The calls were wasted time for the therapist because I could not get active anyway.'*(P44).

The need for more therapist input was absent from FIT, with the exception that some participants wanted **5.2 more support to learn imagery**, in the context of wanting to master imagery right from the beginning: *'I need more contact in person at the start to really learn more about the imagery...'*(P23); *'The imagery is key and needs to be practised more at the start with the trainer.'*(P18).

Participants in MI, but not FIT, expressed **5.3 fear of relapse**, worrying about not being able to sustain changes they had made, specifically often stating they wished for a longer support phase: *'I am worried about not being able to keep it all up because there won't be positive call support now for six months.'*(P56). By contrast, in **FIT** many participants said they had **5.4 No fear of relapse**. The majority of participants seemed to have developed better self-regulation skills, were confident changes would continue, even though entering an unsupported maintenance phase: *'Absolutely fab programme, don't change it...I am not worried! If I mess up I start over again without trouble.'*(P47). Several participants even ascribed this confidence to imagery techniques they had been taught: *'If have a naughty week coming now I can pick myself up again with the motivation coming from seeing myself in a more positive successful place.'* (P23)

'...I am not worried one bit about the calls stopping because I know what to do now. I have got this now and can use it for many things in my life.'(P5)

'Perfect as it is...I want to say that it was really the imagery...Imagery worked really well and will work well in the future now when I don't have support...I am very sure of it.'(P51)

'I feel able now to tackle anything! ... I still have a few areas of my life to sort out and I will continue to use visualisation to help me along.'(P50)

There was some evidence of **5.5 future orientated thinking** in **MI**, with some participants expressing how they felt they were on the right track to make future changes: *'...I have not lost weight yet, but I feel like I am on the right path...'(P16); 'Holding this weight is a challenge now, but I feel like I might be able to do it.'*(P60). In **FIT**, this future-orientated thinking was more pronounced and often described as a **5.6 mind-set change**: *'I am in charge of my life now...and I am motivated to make positive changes. The mind has changed, very positive outlook...'(P55); 'I am in a different frame of mind about stuff now, I can continue on and enjoy what I am doing and not worry.'*(P23). This mind-set change was frequently linked to positive feelings about continued, life-long change, with many participants stating they were enjoying the journey: *'...now in the right frame of mind to keep these changes going- maybe even for life because I am enjoying everything I am doing now.'*(P28); *'I have the strength to do it this time...and to know that it was going to be for life did not scare me.'*(P61). This mindset shift was also apparent in how some participants viewed lapses: *'...I view lapses for what they are now – a tiny issue that I can get on top of right away or when I feel like it.'*(P9)

Uniquely in **FIT**, some participants mentioned specific techniques they had learned and how they were essential because they helped in keeping on track. **5.7 plateau exercise**: *'What really really works for me is...I was stuck on a terrible spot where I was not losing anymore and I felt so frustrated...I was taught to appreciate all the other things that have already improved and to enjoy those...I have already achieved so much and I really needed to remember that the contrast to how it was before, to keep looking ahead and not giving up.'*(P22)

Theme 6: Barriers

When we asked both groups if they had any further comments, the theme of **6. Barriers** was only found in **MI**. The **6.1 overcoming barriers** sub-theme was mentioned by one participant who wrote: *'I had many injuries and I still kept going.'*(P17). Others in **MI**

attributed lack of progress to injuries or ill-health: *'nothing much changed, but that might be because I fell off my bike riding and broke my arm...'* (P44); *'...injured myself two weeks into trial, so lost interest in trying...'* (P12); *'...on some days it was hard to motivate myself due to my depression.'* (P29). The **6.2 Cost of exercise** was also an issue in MI: *'If there was any way studies could give concessions on gyms and pools I would sign up all the time! It is difficult to keep my swimming up because of costs involved.'* (P14). In keeping with these statements, there was a general **6.3 external locus of control** in MI: *'...hasn't been easy due to unexpected things outside my control...'* (P12); *'I have had many issues over the past months and weight has really not been on my mind much.'* (P44).

Theme 7: Imagery

We asked participants in the FIT group ***'Did you use imagery (at any stage throughout the six months); could you give an example please?'***, prompting theme 7. **Imagery**. Rather than giving concrete examples of specific imagery exercises, answers were generally broad and spontaneously covered several aspects of using imagery. Imagery exercises appeared strongly linked to participants' **7.1 emotions**: *'...if I have a day where I pig out I don't fall to pieces anymore, I just use my imagery then and I know it was just a day ...I just carry on – no hard feelings.'* (P33)

'I started off angry, like angry at myself like I was on other diets before and then had a change of heart...it was there in my head and working...' (P11)

'I have really pulled myself with your help, out of a really dark place. I use the imagery every morning. It has helped me become a stronger, happier and healthier person.' (P50)

Several participants also noted that when doing **7.2 imagery in general** it helped to focus on elements that otherwise might be missed: *'The imagery is very powerful and sometimes it gets you to notice things you might have missed otherwise.'* (P54)

Imagery in general was seen, by several participants, **7.3 an adaptable skill**: *'The imagery was very useful when I had bit my nails. Thank you for teaching me such a flexible skill.'*(P20); *'I use imagery for other things now too- planning my hectic week and dealing with worries about my children.'*(P51); *'I have more patience for my daughter because I go to my room to focus on positive imagery when we're about to have an argument and it helps me stay calm.'*(P49). It was also deemed helpful by several participants in the context of impulsive behaviours: *'The imagery is useful in those moments when I am still up and my husband has gone to sleep and I just feel ...like grabbing the biscuit tin.'*(P28); *'I used imagery, but mostly to imagine a healthy alternative to a meal instead of giving in to cravings for things like take-aways.'*(P2); *'...The positive images when ...not at first but then it worked really well...especially when I wanted to snack and focused on my goal instead.'*(P18)

A few participants gave examples of spontaneously adapting imagery exercise to help with work-related stress: *'The positive imagery also helps me a lot, especially when I'm stressed with work and just that one little thing goes wrong and the new routine is in danger of dropping ...then I do it and it helps me cope with stress from change more flexibly'. (P23)*

'I was off with work stress...but imagining my first day back...eased my worry about the day. I got through it because I rehearsed it and even turned out better than I had imagined.'(P42)

It sounded overall as though imagery had become **7.4 a cognitive habit**: *'It feels like the imagery now has become a part of something that just happens...I just use it all the time, but don't use effort now, just happens in many different situations.'*(P51); *'I only used imagery at the beginning and then it just became sort of integrated without me thinking of it.'*(P5)

Theme 8: Goal setting and action plans

In the **MI** group we asked about **8. goal-setting and action plans** which were worked out collaboratively in the therapeutic session and filled in on a goal-sheet: ***‘Did you make use of your goal sheet and action plans? In which ways did you do that?’***

Many participants said they used the goal-sheet to stay on track and to gain motivation **8.1**

motivation and maintenance: *‘...I had it by my bedside to review goals and so on, to motivate myself.’ (P32); ‘Yes! In the evenings I would check back if I had done everything I had said I would do. It helped to keep motivated.’(P61).* In keeping with the desire for more

therapist input, several participants expressed a wish for **8.2 extended self-monitoring**

support: *‘I would have liked some more homework/booklets, sheets for supporting my goals and maybe a nice diary for progress, so that I could look back on efforts and not lose heart too quickly with new goals and plans that might be hard to get going on at first.’*

(P34). Many participants admitted that the goal-sheet and action plans were **8.3 quickly**

forgotten: *‘Yes, but only at the start because then I forgot to look at my plans and my goals...’(P44)*

Theme 9: Continued phone support

When we asked all participants if they had any **Comments**, nearly all participants were very appreciative of the programme, but many in **MI** wanted more **9. Continued**

phone support: *‘The programme is perfect...but I wish phone support would be available a little longer. Six months is great, but sometimes feeling a bit shaky still.’(P23)*

7.4. Discussion

An inductive thematic analysis of our anonymous participant experience questionnaire data revealed that both intervention groups favoured self-chosen lifestyle changes, over adhering to ‘boring’, ‘restrictive’ diets, provided by commercial programmes and other self-help options. Rather than feeling unsupported in the absence of advice, or prescribed diet and exercise routines, the decision to omit lifestyle education and advice

was praised by all participants. Most deemed this approach much more motivating than past weight loss attempts and some described it as 'empowering'. This enhanced motivation could be reasonably expected from client-centred approaches, such as MI, with its focus on exploring discrepancies between clients' personal goals and current health behaviours, reducing ambivalence about behaviour change and drawing attention to their own incentives and desires for change (Miller&Rollnick, 2012).

FIT aims to strengthen motivation further using mental imagery exercises to enhance desire for goals, mentally try out different plans for achieving them, and boost self-efficacy. FIT trains participants to set proximal goals and develop and practice goal-related imagery themselves. The focus is on positive imagery – enjoying an apple rather than abstaining from dessert, for example. Pairing imagery practice with routine behaviours is intended to help develop a cognitive habit of imagery. Participants who received FIT communicated greater confidence than those who received MI, less desire for more therapist input, and praise for imagery as a tool that they could adapt to other areas of their life.

The majority of responses in the FIT group, contained much richer detail, were more positively charged and future-orientated across all themes. MI participants said for example 'my heart was more in it this time...', but in contrast FIT participants said '...I feel like the sky is the limit...'. Many participants, in FIT and MI, observed improvements outside of weight loss, especially in personal fitness, health issues (diabetes, liver disease, hormonal problems), mood and sleep. Most participants spontaneously reported increased happiness and there was a sense of interventions contributing to a more positive home environment, compared with previous weight-loss attempts. Some MI participants attributed more time spent with family to better mood, whereas several participants in FIT stated their new attitude to food and physical activity, especially the enjoyment of trying new things, having more energy and making changes with ease, had translated into

playing more with their children, the whole family getting involved in cooking and food choices. Social support is essential in facilitating the ideal environment for behaviour change to thrive (Ryan et al., 2008). Family-based social support was perhaps made easier, due to the motivational approaches used because participants were not isolated from other members of the family, by for example a specific diet plan.

There was an overwhelming sense that participants in both groups gained pleasure from the actual life style change behaviours they had engaged in so far, especially enjoying new physical activity routines, or being more mindful about food choices/quality. In FIT however, many participants particularly mentioned that ‘enjoying the journey’ was driving their confidence about future achievements and being able to keep up the changes ‘for life’.

Indeed, successful weight-loss maintenance (10% body-weight percentage loss, maintained at least for 1 year) is associated with new sources of motivation because the original sources (positive feedback from others, or noticeable improvements in physical fitness), fall away and/or become less tangible over time (Greaves et al., 2017). Several studies in Greaves et al.’s (2017) qualitative systematic review of individuals trying to maintain weight loss, or to continue weight loss, after completing a weight loss programme, reported more intrinsic motivation (once ‘external pushes’ ceased) amongst weight loss maintainers. This intrinsic motivation was linked to enjoyment of lifestyle behaviours that mediated weight-control, such as for example taking pleasure in exercise (Greaves et al., 2017). These qualitative data and our data suggest that interventions need to focus more on increasing pleasure and desire for functional life style behaviours (as we do in FIT), not only goals. In the eHealth domain for example this is an approach frequently used to justify gamifying health apps (Johnson et al., 2016).

A spontaneous and dominant theme exclusive to MI participants, was their dependence on therapist support, especially in the context of affirmation and solving

problems. They asked for more frequent and continued counselling support, face-to-face, or by phone and also wished for more stringent self-monitoring requirements to be introduced. This was perhaps due to the fact that the majority had taken nearly six months to implement the first changes and were now worried about their ability to sustain these in the future. In FIT, even though non-judgemental positive support, affirmation and booster calls were valued in both groups, no desire for continued therapist support was expressed. There was an overwhelming sense of confidence that FIT had effected a 'mind-set change' and that changes were '...for life...'; behaviours would be maintained and further improved, even when faced with barriers. This pattern was supported by the weight loss data from the current RCT; the FIT group lost substantially more weight by six months and continued to lose weight through the unsupported six-month maintenance phase, in contrast to MI who had lost minimal weight at six months, comparable with that reported in the MI literature (Armstrong et al., 2011) and stabilised at 12 months (Solbrig, Whalley, et al., 2018). The only wish for extended support in FIT, expressed by very few participants, was for imagery techniques to be practised in more depth at the beginning of the programme, to facilitate mastery faster.

Imagery was rated by most FIT participants as the best part of the programme (MI participants rated therapist support as the best part) and perceived as a tool one could routinely apply in pursuing personal goals and managing challenges. The MI group was the only group that mentioned barriers to goal pursuit, such as injuries, mental health problems, or cost of exercise. In contrast to MI, in FIT, external factors such as family problems, and internal factors such as depressive mood, did not appear to affect motivation and confidence in the ability to make changes; indeed, such problems were sometimes reported to have improved through positive imagery-use. The difference between FIT participants feeling self-motivated and MI participants feeling more reliant on the therapist is consistent with recent literature on imagery and emotion. In MI, motivation

and self-efficacy are built by reviewing successful past attempts at behaviour change and by encouraging talk about change. Change talk supports confidence by changing people's perception of themselves as agents of change (Miller & Rollnick, 2012). In this respect MI is overwhelmingly verbal whereas recent literature on motivation (Kavanagh, Andrade, May, Connor, 2014) and emotion (Renner et al., 2017) suggests an important role for episodic multi-sensory mental imagery in behaviour change (Knäuper et al., 2009; Parham et al., 2016). MI is typically delivered in a clinical environment, removed in time and space from the actual decision situations. MI strategies, even though self-generated, might therefore lack vivid and easily available detail, to be successfully translated by participants in day to day life (Kavanagh et al., 2014). For example, when we measured motivation and self-efficacy quantitatively for dietary and physical activity changes over the first month of the active intervention phase, following two FIT and MI sessions, both were increased, but change was significantly higher in the FIT group, compared to changes in MI (Solbrig, Kavanagh, et al., 2018). This is in line with the present qualitative data. FIT explicitly uses imagery to increase desire and self-efficacy for change, amplifying emotion beyond the impact of verbal discussion. Indeed, the FIT group spontaneously mentioned successfully adapting imagery techniques they had learned to improve self-regulation in other challenging situations, for example in the context of managing work-related and family-based stress. In MI there was no spontaneous mention of techniques applied outside the therapy setting, perhaps because the techniques used are less transparent and more dependent on the therapist's responses than the participant's cognition.

A potential limitation is that both interventions were delivered by the same researcher, with potential for contamination or bias. However, as reported in chapter 4, intervention fidelity across both interventions, rated by a research assistant who had no involvement in the project, was high and no differences in intervention likeability ratings were observed (Solbrig et al., 2018). We cannot distinguish responses from individuals

who lost a lot of weight and those who had limited success because responses were provided anonymously, to minimise the social desirability bias to which interviews are prone (Nederhof, 1985).

This study was the first to directly compare participant experiences of two motivational interventions for weight loss, MI and FIT. Our findings provide support for the efficacy of both interventions, even – or especially – in the absence of lifestyle advice. Participants responded particularly enthusiastically to the training in goal-related mental imagery provided by FIT.

Chapter 8: General Discussion

In this thesis I have investigated and furthered the acceptability and efficacy of Functional Imagery Training (Andrade et al., 2016; Kavanagh et al., 2018), in the context of weight loss and weight loss maintenance. I have also directly compared the efficacy and acceptability of FIT with the most established and effective motivational counselling intervention to date: Motivational Interviewing (Miller & Rollnick, 2012). In this discussion I will present the main themes of my research and address major limitations, in the light of avenues for future work and FIT development.

8.1. FIT for weight loss maintenance

The most important focus in weight management today is to prevent regain after initial loss (Dombrowski et al., 2014; MacLean et al., 2015). FIT showed promise not only for supporting weight-loss, comparable to that of commercial weight loss programmes, community based group programmes and named diets (Ahern et al., 2017; Borek et al., 2018; Johnston et al., 2014; Truby et al., 2006), but also for supporting long-term weight management across two studies. Trials of behavioural interventions, including those delivering motivational weight loss maintenance support over several years (Coughlin et al., 2016; West et al., 2011; West, Gore, DiLillo, Greene, & Bursac, 2007), usually demonstrate immediate steady weight re-gain upon completion of the initial weight loss intervention phase. The RCT (chapter 6), showed that under four hours FIT, spread over six months, demonstrated greater efficacy and clinical significance than contact time-matched MI for weight loss. After a six-month unsupported weight-loss maintenance phase, only FIT participants continued to lose weight. In the uncontrolled pilot study participants continued to lose weight by one-year follow-up, following a shorter FIT intervention phase (3 months, under 3 hours). These quantitative data support our original assumptions that the innovations of using imagery and training self-motivation produced stronger, and longer-lasting, effects on weight loss than MI. Chapter 4 confirmed that FIT

boosted self-efficacy and motivation more than MI alone. Yet, several limitations remain. All FIT sessions across both, the pilot (chapter 3) and the RCT (chapter 6) were delivered by me. Future work needs to establish that FIT can be delivered, with high fidelity, and effectively, outside academic settings and by other therapists. Longer trials of FIT are also needed to establish that it can produce continued weight-loss, past six months of maintenance, or past 12 months (compared to a control).

Qualitative data from study 1 (focus groups, chapter 2) and the RCT (chapter 7) add additional weight to my hopes for FIT's potential as a long-term, motivational, weight-loss maintenance tool. Study 1 (chapter 2) confirmed that the issue of waning motivation and the desire for motivational support were strong themes amongst individuals trying to lose weight, or managing maintenance on their own. Encouragingly, all participants were very positive about FIT. Focus group participants appeared to recognise FIT's broad scope and its potential future role in encouraging motivation long-term, only after a short introduction, without having experienced it themselves. One participant said: *'What you are doing with FIT is about lifestyle isn't it? I feel like your programme can teach people to think differently...and to keep up motivation.'* and another person commented: 4A: *'Yeah, I mean what you are doing is more of a lifestyle thing isn't it? ...This FIT training is more like changing your mind-set and teaching you to think differently about food and exercise.'* This key theme of a mind-set change/or shift was not a fluke. It was identified consistently in the qualitative RCT participant experience data (chapter 7), but only in the FIT group. Both the MI and FIT groups expressed heightened motivation and self-efficacy, but only FIT users used expressions, such as: 'I feel like I am ready for anything!' Additionally, FIT RCT participants were much less reliant on therapist support, than MI users and found creative ways of successfully applying imagery to barriers, such as cravings and impulsivity. Interestingly, they did not specifically label cravings and impulsivity as barriers; they simply mentioned them in examples of how they used imagery in their daily lives. In comparison

to MI RCT participants (who were very worried about their ability to keep changes going), FIT users were not worried about the potential of relapsing into old habits and given their continued weight loss at 12 months, they did not appear to either. Greaves et al.'s (2017) systematic review of 710 participants' experiences (enrolled in several European studies), trying to manage weight-loss, or maintenance, found weight-management was often described as a 'constant battle' that drained mental effort. Many participants mentioned that this led to instability in keeping up positive weight management behaviours, made them more negative, impulsive and prone to craving, resulting in relapse. It appears our FIT RCT participants did not experience such barriers and if they did they felt confident they could overcome them using strategies from FIT. Future research could focus on developing and testing FIT as a weight loss maintenance intervention, perhaps as an add on to tier 2 treatments, which are plagued by fast weight regain (Bessesen, 2006), to boost continued adherence to newly established behavioural regimen.

Limitations

There are several limitations which need to be addressed to get commissioners interested in FIT for weight-loss. My PhD focused on developing FIT in the context of weight loss and the RCT (chapter 6) investigated the question 'does it work?'. We did not conduct an exhaustive process evaluation which leaves uncertainty in regards to implementation, setting and costs, for commissioners who might wish to see FIT implemented in tier 2 weight management settings; we do not know how it can be rolled out yet. We explored some process variables such as participants' experiences of FIT, which showed good acceptability and engagement, but we could not explore how it was received by those delivering it because I was the only person delivering the interventions throughout the project. Future research needs to explore how FIT might be received by those delivering it within multiple public health settings. We were unable to explore cost-effectiveness realistically because the RCT was run within academia, outside of public

health settings. We do not know if FIT can be cost-effectively delivered and sustained compared to tier 2 treatment as usual, given lack of knowledge of for example what extra resources are needed, what resources are already in place and unknown staff time costings. A serious issue is participant engagement which affects practitioners' motivation, cost-effectiveness of service delivery, the time required for recruitment, and the accurate representation of service impact (e.g., scale-up, reach, and dissemination). We experienced excellent engagement, retention and recruitment, but PHE and Clinical Commissioning Groups who fund tier 2 weight management services across England struggle to recruit, to engage and retain participants (Coulton, Dodhia, Ells, Blackshaw & Tedstone, 2015). Any future multicentre trial of FIT should include a process evaluation and cost-effectiveness analysis to help service providers and commissioners make informed decisions on viability and sustainability of FIT.

The present research did not properly attempt to test the underlying mechanisms of FIT. FIT was developed from EI theory, which posits a central role of mental imagery in motivation. More vivid imagery of goal achievement should strengthen motivation and more vivid imagery of goal-related behaviours should strengthen self-efficacy. Future research on mechanisms of efficacy should test whether frequent and vivid goal-related imagery mediates increases in motivation and self-efficacy, and whether these in turn mediate weight loss in the early stages of a behaviour change attempt.

Another limitation to the current research is the lack of men in all the empirical studies. A recent systematic review of RCTs for weight-loss and maintenance programmes (12 months minimum follow-up) open to both women and men (like our RCT, chapter 6), found no significant difference in weight loss between men and women, but identified that men only represented 36%, 4771 out of a total sample of 13305 participants in the 13 included RCTs (Robertson et al., 2016). In the UK, 66% of men compared with a smaller percentage of 58% women have overweight or obesity. Engaging more men in weight-loss

research should be a priority (Hunt et al., 2014). We already know that it is difficult to engage men in weight-loss support generally and that men are underrepresented in commercial and communal weight-loss programmes (Bye, Avery & Lavin, 2005; Wolfe & Smith, 2002). Wolfe and Smith (2002) qualitatively investigated what motivated men to seek help with overweight and obesity. They found that men were generally motivated by health issues and wishes to change their physical appearance, yet they preferred individualised support to group-based programmes, a physical activity focus and valued autonomy in dietary choices; Robertson et al. 2016 observed similar trends in their systematic review. FIT and MI tick all of those boxes; they are delivered individually, non-prescriptive, client-centred and allow participants to focus on whatever goals they wish to achieve, providing autonomy in food and physical activity choices. When we advertised for our RCT, we invited people to try out 'motivational interventions for weight-loss', no other content or delivery details were provided. Future research must focus on how to improve recruitment of men into weight-loss trials. There is scope to explore what men with overweight and obesity might find attractive in terms of branding, advertising, delivery and content. Setting of weight loss programmes appears to be another area worth considering for future studies and current tier 2 weight-loss provision. Hunt et al. (2014) conducted a randomised controlled weight-loss trial within professional football club settings in Scotland, in 747 male football fans, reported no issues recruiting and documented excellent retention in the intervention group (95%) and even the 12-month wait-list control (89%). This approach was also effective; at 12 months the mean difference in weight loss between groups was 4.94 kg (95% CI 3.95–5.94). The intervention consisted of 12 x 90-minute weekly sessions, focusing on healthy eating and physical activity advice, with a heavier focus on exercise in later sessions as men increased in fitness, all delivered in football club settings with additional peer-support (Hunt et al., 2014). When we advertised our RCT (chapter 6) in the Plymouth Shopper (now the Plymouth Chronicle, free

community newspaper) it was made clear that the research was conducted at the University of Plymouth, sponsored by the university and NIHR. We did not explore the readership in great detail, neither did we engage any customer mapping research methods to understand how to best engage the local male population. In the future it may be worth considering targeted placement of advertising and the actual weight-loss interventions in predominantly male work places, sports clubs and community sports hubs connected with local football, rugby and cricket clubs.

8.2. A note on lifestyle advice, education and knowledge

We provided no lifestyle advice, information, or nutritional or exercise regimen in the pilot (chapter 3.), or the RCT (chapter 6.). Firstly, this was in keeping with the autonomous spirit of MI which FIT retains. Secondly, we focused on process, rather than content outcomes and wished to avoid prompting content and behaviours, by providing advice, information, or set meal and exercise plans. We were supported in this decision as early as the focus group study 1 (chapter 2). In this study, nutritional, or physical activity advice did not come up as a theme when we asked what type of support individuals desired to help them and there seemed to be a general consensus that many great weight loss resources were already freely available, in print and online, and that this should not be the focus of weight management support. The participant experience data from the pilot (chapter 3.) showed great satisfaction with FIT overall. The qualitative data from the RCT (chapter 7.) further confirmed that participants in MI and in FIT felt that finding their 'own path with this' was deemed motivating and 'empowering'. They generally expressed that their 'heart was more in it' this time. And both groups felt that prescribed diets and exercise regimen (by for example commercial weight loss programmes) were boring and restrictive.

Perhaps some caution needs to be expressed. Even though we recruited from the general public (for the RCT), we may have attracted an already fairly engaged and informed population sample (e.g. the kind of person that would sign up for a study

conducted at a university). All, but one participant had tried to lose weight before which also may have made them more knowledgeable, but certainly not more successful given the fact that they were still struggling with overweight, or obesity. And in a recent, large cross-sectional study, exploring self-management in glycemic control Chen et al. (2018), found that knowledge about type 2 diabetes and how to manage it for example, did not correlate with actual self-management behaviours. Additionally, McCluskey and Lovarini, (2005) tested the effect of an educational intervention (a 2-day workshop and outreach support for eight months), on knowledge and behaviour, to improve evidence based practise amongst allied health professionals. Measures were collected at baseline, post-workshop, and eight months later. Behaviour was measured using an activity diary (% engaging/not engaging in search and appraisal activities). Post-intervention, allied health professionals' knowledge was significantly increased. These changes were maintained at follow-up. Additionally, fewer health professionals reported a lack of searching and appraisal skills as barriers to evidence-based practice. Yet, behaviour change was very limited, with nearly two thirds of health professionals still not reading any research literature at follow-up. Education, knowledge and skills alone do not appear to motivate behaviour. Future research should assess whether FIT works best as an alternative to established tier 2 provision based on lifestyle education and advice, or as an adjunct to it.

8.3. FIT and e-health

Another potential area of future development for FIT emerged from study 1 (chapter 2.) and the qualitative data from the RCT (chapter 7.) was motivational e-health support. Our focus group participants confirmed a common desire for motivational e-health support. They offered several suggestions on how current app and web support could be improved. They wanted future apps to have simple user interfaces, be tailored more flexibly, leaving room for personalisation. They especially wished for apps to sync better with their individual needs, goals and goal-setting regimen, reminders, schedules, and not to be

badgered into prescribed and limiting routines, diets and timeframes. These findings are in line with existing data on how to best engage app users (Bardus et al., 2016; Tang et al., 2015) and show promise for expanding motivational support in apps, beyond the inclusion of generic feedback and progress reviews. Shingleton and Palfai (2015) for example reviewed studies that reported using MI based components for health-related behaviours, delivered via technology, and found them to be very well accepted. Jackson et al., (2011) showed these advances were effective too. They successfully increased fruit and veg intake amongst pregnant women, using a video MI counsellor (Jackson et al., 2011). If FIT is found to be effective for weight management, it could be developed as an app and web-based intervention. This would enable much wider access to FIT self-management (most relevant in remoter parts of the country, like Cornwall and Devon), in line with what potential service users need and want. It could also be more cheaply delivered than counselling interventions within community, or primary care settings. Given the non-inferior weight loss results achieved by interactive computer-based interventions, or those using mobile and web-based technologies (within primary care and research setting) (Levine et al., 2014; Tang, Abraham, Greaves, & Yates, 2014; Wieland et al., 2012), compared to usual care, such as advice and information giving, this appears to be a promising area of future development for motivational interventions. We would expect reduced effectiveness compared with delivery of FIT by a trained practitioner with active listening skills, but benefits compared with web-based information and advice.

A third of FIT RCT participants used the 'Goal in Mind' app. The most popular feature was the guided imagery audio. Those participants who did not use the app for whatever reason, could still access this via an Mp3 audio file that was emailed to them. Most participants found the audios very helpful, especially when setting new goals, when practicing their imagery and when they had been off course for a while and wished to get back on track quickly. Future developments of FIT could include more audios to support

imagery practise, and perhaps even to take over the introductory tasks, such as the lemon exercise, to cutting therapist time and support self-management more extensively.

8.4. Future directions outside of weight management

Chapter 6 gave rise to another three potential directions for FIT intervention development, outside of weight management. FIT RCT participants often mentioned they used the imagery strategies they had been taught for working on their weight loss goals, to manage family and work-based stress. One participant in particular described how it helped them to get back to work with confidence after a long absence, due to burn-out and work-related stress. They felt their anxiety about their first day back had been reduced, due to rehearsing it in imagery and addressing potential pit falls of the day in the same way. Several participants also reported that the positive imagery exercise had improved their mood and helped ease depressive symptoms they had been suffering from for several years.

Work-related stress and depression are significant personal and public health issues. Around 300,000 individuals in Great Britain drop out of work each year because of mental health problems (Stevenson & Farmer, 2017). Long-term sickness absence and reduced productivity through ill health create economic burden to employers and taxpayers (Department for Work and Pensions, 2012). Mental health conditions are the most common cause of long-term absence (Sinclair, 2016). Stress, depression and anxiety account for 49% of all working days lost due to poor health (Health and Safety Executive, 2017). These mental health problems are closely related. The most commonly reported causes of work-related stress are workload pressures, tight deadlines, too much responsibility, lack of managerial support, bullying, threats, or violence and changes at work (Health and Safety Executive, 2017). These stressors significantly contribute to the manifestation of depressive symptoms (Salavecz, Stauder, & Purebl, 2014), which can predict the onset of depressive disorders (Bonde, 2008; Nieuwenhuijsen, Bruinvels, &

Frings-Dresen, 2010). Depressive symptoms correlate with work-based stressors such as job adversity and lack of workplace support (Schonfeld & Bianchi, 2016). Anxiety can develop as a symptom of prolonged stress (National Institute of Clinical Excellence (NICE), 2009) and is also a core symptom of both depression and work-related stress (DSM 5, 2013). Thus, acute work-related stress, defined by NICE (National Institute of Clinical Excellence (NICE), 2009) as, 'the adverse reaction people have to excessive pressure or other types of demand placed upon them', can develop into chronic mental illness if left untreated. So, there is in fact an urgent need to provide better support for individuals who experience high levels of work-related stress. Previous interventions for work-related stress have tried to help people focus better on the present moment, through relaxation or mindfulness training, or change their beliefs and behaviours through cognitive behavioural therapy (Beck, Hansen, & Gold, 2015; Blonk, Brenninkmeijer, Lagerveld, & Houtman, 2006). The first approach is relatively ineffective and the second is expensive. FIT, if developed for use in the context of depression, anxiety and work-related stress would be the first theoretically-grounded intervention to help individuals reduce their symptoms by eliciting and training functional imagery. We predict that FIT would boost mood, increase motivation and self-efficacy for behavioural goals, and increase success in achieving those goals. Success in achieving initial sub-goals would reduce anxiety and build confidence for tackling, rather than avoiding, new goals. These predictions are supported by the personal experiences of participants in our weight loss RCT who experienced work-related stress or other anxiety disorders.

8.5. FIT training and quality assessment developments

Over the past three years, we have worked with practitioners in diverse settings, adapting FIT to their patients' needs. Jackie Andrade and I have developed a 2-day workshop training for FIT, with input from David Kavanagh at Queensland University of Technology in Australia. So far, we have trained psychologists, counsellors, and

psychiatrists working in alcohol dependency, chronic pain, weight loss and physical activity increases at the Torbay and South Devon Hospital Trust. We have also developed FIT manuals with the eating disorder clinic and mental health care provider The Retreat, in York. We trained their dieticians, physio therapists, psychiatrists, clinical psychologists and occupational therapists and demonstrated ways of introducing FIT into their diverse daily practises. Currently, we are working with Broadreach House in Plymouth (our local drug and alcohol rehab) on implementing FIT into their programme. Out of all this collaboration, training and future research potential, grew the need to develop, not only structured manuals, but also a practitioner's handbook for FIT (appendix G). We are currently assessing usefulness of our first standardised fidelity assessment in the context of alcohol dependency FIT treatment; we hope to use this tool to assure a minimum standard quality of FIT delivery in the future.

Developing fidelity measures for FIT was important in the context of reporting research results of FIT and checking practitioners' skills. The majority of MI studies included in the most recent systematic reviews and meta-analysis (Armstrong et al., 2011; Barnes & Ivezaj, 2015) lack reporting on fidelity measures. In Barnes and Ivezaj (2015) for example, only two out of 24 reviewed studies reported the results of standardized fidelity ratings. It is important that future studies include fidelity tests. Firstly, there are no obvious reasons, asides from perhaps time pressures in primary care, to neglect treatment fidelity assessments. The Motivational Treatment Integrity Code (MITI, 3 and 4, Moyers et al., 2010; Moyers, Rowell, Manuel, Ernst, & Houck, 2016) is a sound, standardised, easy to use measure, developed for rating treatment fidelity in MI. Secondly, the use of treatment fidelity measures has been linked to improved weight loss outcomes when using MI for weight loss (Armstrong et al., 2011), therefore fidelity should be assessed and reported. It is difficult to make conclusions about the effectiveness of an intervention when the quality provided in studies cannot be assessed. There is a real issue with lack of fidelity reporting

of MI interventions and metanalysis are always plagued by huge heterogeneity which may deliver a distorted picture of how effective MI is. For the RCT (chapter 6), we developed a FIT fidelity checklist based on the trial manual (appendix C) to ensure the therapist had included all the necessary components in delivering FIT. We used the MITI to check the quality of MI in both the FIT and MI arms of the trial. We have since worked with colleagues using FIT for alcohol reduction in Australia to develop fidelity measures styled on the MITI to provide a more complete assessment of quality.

An issue, especially for commissioners interested in commissioning FIT for weight-loss is that we cannot predict how much training the NHS band 3-5 health practitioners who are routinely employed by PHE to deliver tier 2 weight management interventions, will require to deliver FIT faithfully. Research has shown that practitioners require more than a one-off workshop to develop MI skills (Miller, Yahne, Moyers, Martinez, & Pirritano, 2004) which are a necessary pre-requisite to learning the delivery of FIT. We need to fill the gaps in this knowledge and design effective, quality assured training and develop a 'training the trainer' package commissioners will find attractive. An effective training should include individual and anonymous group performance feedback, training refreshers and personal follow-up coaching (Miller & Rose, 2009). Butler et al. (2013) demonstrated that primary care practitioners could be trained to deliver opportunistic behaviour change counselling, derived from MI approaches with high fidelity, in order to change patients' health-related behaviours. The training included two seminars and a web-based component. When training practitioners in MI approaches, competence in using skills such as open-ended questions, reflective and active listening and summarising patients' statements are essential (Emmons & Rollnick, 2001). The further development and evaluation of specific training strategies are essential for designing effective motivational behaviour change interventions like FIT. If practitioners are not trained effectively, are not confident in the methods they have learned and therefore under-use them, or do not use them at all, it is

unlikely that motivational treatments like FIT will be successful in public health settings (Oakley, Strange, Bonell, Allen & Stephenson, 2006). It may be particularly useful to develop novel methods of training in MI and FIT that are feasible within public health contexts. Designing bespoke MI and FIT training, tailored to individual services and time frames, should therefore be another focus of future research before implementing FIT as a public service.

8.6. Conclusion

We demonstrated efficacy of FIT for weight loss and showed that it satisfied participants' desire for motivational support rather than lifestyle education. Future research should test the effectiveness of FIT for weight management in healthcare settings and its efficacy for tackling other health problems where behaviour forms a component (e.g., addiction and anxiety). Developing training protocols and quality assurance processes will be an important part of these future developments.

Appendix A: FIT pilot session manuals and booster call manual

Appendices

Appendix A: FIT pilot session manuals and booster call manual

FIT pilot session 1 Physical Activity

Introduction

“Thank you for coming in today and for volunteering to take part in this study. If you have any questions or concerns during this session, please feel free to ask at any time.”

“I would also like to let you know that you are free to stop this session at any time and withdraw any other data that you have provided.”

“And if there is anything that makes you feel uncomfortable in today’s session, please let me know and we can just skip that part.”

“I believe that you’ve been thinking about making some changes to your lifestyle, possibly losing a bit of weight and becoming more active as well, is that correct?”

(If not correct, restate the purpose of the study and redirect)

“Great, I understand. Keeping yourself fit and trim of course involves a range of healthy lifestyle actions. Today I would like to focus just on you current physical activity levels. Do you already have an idea of what you want to do?”

(Write down Answers about activity changes into record sheet).

Imagery

“Before we move on to discussing how you’re feeling about how active you are at the moment, I’d like to talk to you about mental imagery because it is a key part of this intervention. I’d like to introduce mental imagery and show you how it can be useful to help change your physical activity levels, if you don’t mind?”

(If no, jump to MI style review of pros and cons of being less active and try to introduce imagery and exercises again at that stage. Then try goal directed imagery part)

“Mental Imagery is the ability to experience objects, people, activities and events by creating an internal scene in our mind, using our imagination. We often use mental imagery in our day to day lives.”

“Have you noticed how when you read a story you often imagine how a character looks and moves; how they might feel to touch or what their voice could sounds like?”

Appendix A: FIT pilot session manuals and booster call manual

“Do you ever create a mental image of something that you would like to do in the future?”
(If no: “That is ok, I will do some exercises later on that will further explain imagery and help you make use of it. If yes:)

“Great. We are going to work on training that ability so you can use it to help you achieve your goal.”

“Today and throughout the program I would like to use the things we’ve learned about imagery, to support you in making your life the way you want it to be.”

“We will practise using imagery at various times throughout this session. Can I show you what it is all about?”

Lemon Exercise

Run through Lemon Exercise Script – included below.

□ “Gaze off towards the wall as you imagine the image. You can close your eyes if you like or leave them open. Please try and use all your senses when you are imagining the scene I will be describing.”

Lemon Exercise – Imagery Practice

“I am now going to ask you to imagine a situation. Please imagine it happening to yourself, as if you were there, and it was happening right now. Imagine as vividly as possible”. ((In the script, pause for about 3s at each “...”))

“OK, Let’s start.”

I want you to look towards the wall, and imagine holding a lemon...

Picture it as vividly as you can, what it looks like, the texture of the skin, whether there is any stem...

Whether the colour is the same across the whole lemon...is there any light or shade on it...

Imagine holding it close up, so you can see every feature...

Now I want you also to imagine what it feels like to hold it...

Imagine what the texture of the lemon feels like...

The weight of the lemon in your hand...Its shape...

What it would feel like if you threw it upwards and caught it...

Keep the picture of the lemon there in your imagination....

Imagine holding the lemon next to your nose. That fresh, tangy smell...

Now, imagine cutting it with a knife. Think about how the knife feels, as you grip it and carefully cut the lemon in two. You might hear a slight rasping sound as you do that...

Small drops of juice come out as you cut it...maybe your hand feels a little wet...

Imagine what the halves look like—the segments, the texture of the inside of the lemon, white pith...

Now you hold half of the lemon to your nose. Smell the juice...

Appendix A: FIT pilot session manuals and booster call manual

Imagine wiping your finger across the surface, and putting a drop on your tongue. A fresh, and acidic taste. Imagine swallowing it, and feeling it going down your throat. A cool, refreshing sensation.

“Now, imagine taking one of the lemon halves in your hand. You have a glass in your other hand, and you are going to squeeze the juice into the glass...Squeezing it now, and the juice is trickling out...You can hear it going into the glass...Take a sip of the juice, and swallow that...

Go back to squeezing the lemon into the glass...

((Speak quickly, more loudly)) Now it squirts into your eye! It is stinging you!

((Look for a reaction—do they wince? – if they do: “Did you notice that you winced then?”))

“Tell me how all of that felt.” (pause for a response)

“How vivid was the image, on a scale of 0-10?”

“Were there any aspects you found particularly real?”

(Did they wince or show any other startle reaction when the lemon squirted?)

“This is the sort of thing I mean, when I am asking you about your imagery. Not just what pictures you see, but also any imagined taste, sound, or smell, or feeling you have when you think about a situation.”

“Now we are going to look at how you can use imagery for motivation.”

Goal directed imagery

“You’ve been thinking about increasing your physical activity.”

“Can we start by thinking about your current level of physical activity. What do you like about it? Are there any down-sides?” (write them down)

If they mention a generic issue or if it sounds like they are repeating what others say:

“How has that affected you?”

If they have listed desired activities at the beginning:

“ You said there were several things you might try. Which one of those would you like to start with?”

If they have not stated anything in particular at the beginning: “Are there any changes you would like to make concerning how active you are?”

Appendix A: FIT pilot session manuals and booster call manual

"Is there anything that would get better if you were to increase your physical activity?"

"How would that affect you?" (write the positives down)

"Would you notice any changes even in the first week?"

(If no:) "Would any improvements be likely to happen in, say, a month?"

"Is there anything else you might notice?" (write down changes)

Summary (keep it short and sweet, you don't want to overwhelm or lose people, keep them engaged at all cost)

"So you said that [insert negatives about not being physically active] and that [insert positives about increasing activity]. Is that right?"

With a potential thing that would get better, briefly elicit imagery:

"So we are going to continue using imagery. So if you would like to make yourself comfy and find a point to gaze at..."

"Let's imagine that you have succeeded at (use specifics if mentioned before or keep it general) becoming more active/at achieving your goal."

"Try to imagine how you will feel when that happens.....visualise where you are.....what is happening around you.....how your body is feeling.....and how you feel within yourself, emotionally."

PAUSE

"How does that feel?"

"Great, let's think about how you can get there. The steps you need to take to make this positive goal more concrete."

"Think about a particular time in the next few days and imagine yourself doing the (activity) you are going to do to achieve your goal."

"Play it out, like you are the main character in your own mini-movie or a TV ad."

"Thinking about those first few days, imagine what happens leading up to the activity...what happens while you are doing it and how it feels as you do it..."

"...and what happens afterwards..how it feels afterwards...what emotions you are feeling..."

Appendix A: FIT pilot session manuals and booster call manual

"Make it as real as you can."

"If your mind wanders, that's ok, bring your attention back to the image and keep playing it through."

"Now imagine further into the future...when you have been working towards your goal, for maybe a few months, or a year. Think of a particular occasion, like a birthday or a holiday and create that scene in your imagination."

(if they already mentioned something earlier, use it)

"Imagine where you are...who is there...what you can see around you, and hear...how your body feels..."

"Remember to use all your senses, and make it as vivid as you can."

"Notice if those things that you thought would get better, got better..."

"How vivid was the image, on a scale of 0-10, where 0 is no image at all and 10 is extremely vivid, as if it were actually happening to you?"

(Record on session rating scale and listen to any issues the person had with constructing the image. If they had trouble, say something like:)

"It can sometimes be hard at first to use imagery- it gets more vivid with practise. Let's see if it had any impact at all."

"What part of that scenario did you enjoy the most?"

"What was so good about that?"

Self-efficacy

"I want you to think about that first image, those first steps you were imagining (towards your goal) PAUSE..."

"How confident are you that you could do that activity for at least a week? – Say, on a scale from 0- definitely can't do it, to 100% sure I can?"

(Record rating/ if lower than 40%:)

"People often feel a bit unsure at first."

"We are going to look at some other things you can do to help you get started."

(If higher than 40%)

"Ok, so you are pretty confident already."

Appendix A: FIT pilot session manuals and booster call manual

Past successes

“Let’s see what happens when you think about that some more.”

“Have you ever tried this (action...swimming...running etc.) to achieve your physical activity goals before?”

Emphasise aspects of success, even if the performance was not perfect. Even temporary behaviour changes can be counted as a ‘success’ (e.g. even if they only increased their physical activity for a week).

(If they have not tried to increase their activity before)

“Have you succeeded in something else that needed willpower, like studying, training for an event, learning to drive or learning to play a musical instrument or language that you have succeeded at?”

Elicit past success imagery:

“What did you do then to make sure that it would happen?”

“Can you tell me a bit more...is there anything else you did?”

“Let’s re-create one of those memories in your imagination. Take yourself back to that time when you successfully”

[achieved goal(any)/ or achieved increasing physical activity in particular, if available].

“Play the memory out as if you were living it again. Remember to use all your senses.”

PAUSE

“Remember how it felt when you did that...” (Note down strategies)

“So you achieved (your other goal) by (summarise strategies)...”

“Could any of those ideas be used now to help you ... [reach your goal]?”

“Let’s choose one of those ideas and imagine using it in the next week or so, just to see if it could be helpful.”

“Close your eyes and imagine yourself using that idea to help you get more physically active.”

“Imagine the first steps you will take to increase your activity.”

Appendix A: FIT pilot session manuals and booster call manual

"And then imagine the next step in the sequence, the next step you would take...using all of your senses."

"Imagine how you will succeed/what you will do to succeed..."

"Let the events unfold in your imagination."

"Focus on all your sensations—what you see..., and hear..., and feel..."

Overcoming barriers

Help them to identify any potential barriers to implementation of the strategy.

"As you were imagining that, were there any parts where something might get in the way that might stop you from reaching your goal?"

"What would you do about that?"

"Okay, great. Now try imagining yourself taking those first steps again to getting more active, but also imagine doing those things you just mentioned, so it really happens."

"This time keep an eye out for things that may get in your way and how you will overcome them."

"How you will successfully work on your goal after all."

"Now keep playing that image through to later that day or night. You've managed to stick to your goal of ... [goal]. Focus on how you feel about that. Focus on your emotions, and physical sensations."

"Imagine how good you feel."

"See the positive effects."

Self-efficacy

"How confident are you now that you could do that for at least a week? – On the same scale from 0- definitely can't do it, to 100% sure I can?"
(Record rating/ if higher than earlier:)

"That's great! You are more confident than before. Just imagining past success and how you can use those ideas to succeed again helped you."
(If above or around 60%)

"Wow- that's great. Sounds like you're pretty confident."

Appendix A: FIT pilot session manuals and booster call manual

(If around 40-59%)

"That's fine for getting started. You don't have to be 100% confident- you just need enough to take the first step."

(If under 40%)

"Confidence often gets stronger once people see what they can do. Is that enough for you to at least take a first step?"

Plan for the next few days

"What do you plan to do now, about the amount of physical activity you get?"

[if needed, prompt with:] "How will you get started with that?"
"What will you do, to stay in control?"

"Sounds like you've thought that through."

"Now imagine doing that over the next week and imagine how good it will feel to be working on your goal..." PAUSE

Practice using imagery cues

"Was using imagery today helpful?"

(If no, perhaps say something like: "Don't worry. Imagery is like any other new skill that becomes stronger and more helpful over time.")

[If yes:] "How did it help?"

"In fact, it will work best if you practice a lot, like anything really!"

"It doesn't have to be for long. And you can do it while you are doing other things. In fact, it will remind you to practice, if you get in the habit of practicing at the same time as a very frequent behaviour, like having a drink, making a cup of tea or going up a flight of stairs."

"Which behaviour do you think would be a good reminder for you?"

"Can we practice imagery while doing another task right now?"

(Take them to a sink or hand them a bottle of water and a glass to pour a drink of water.)

"Now I want you to roll out that private movie you have created in your mind as vividly as you can. Go through all the steps you will take to work on your goal. Make use of the ideas you told me so that it really happens."

"Work around things that might get in the way."

Appendix A: FIT pilot session manuals and booster call manual

"And then imagine how good it will feel to succeed."

"How was that for you?" (Reassure doubt)

"If there is a difficult situation coming up, where you might be likely to forget practicing your imagery, you might also want to set a reminder on your mobile phone."

"Or you could stick a note on your mirror or fridge at home to remind you to practice."

"Is there a time tomorrow, where you'd like to have a reminder to practise the imagery?"
[If yes, get them to set that reminder—if it is a recurring issue, ask them to consider having a recurring reminder on their phone for the next few days].

Review of session

"Would you be able to practice what we've done over the next week?"

"And I will be talking to you, on the phone, at the end of that first week and do some more practise with you if that is ok?"

"When you are practicing your imagery, really focus on the positive outcomes and how you will feel"

"Remember those times you've been successful in the past"

"Try to run through scenarios in your head where there might be obstacles to overcome; imagine how you will face these obstacles to achieve your goal, and how you will feel when you do."

"Do you have any questions?"

Make a phone appointment ...

2. FIT pilot session 2 diet (delivered by phone)

"Hi xxx, It's Linda from Plymouth University. How are you today?"

"That's wonderful. I'm calling in regards to the weight-loss trial you are enrolled in. Are you still available to do your second session of imagery training with me now?"

If Yes – "That's wonderful. Thank you for your time. I'd like to talk to you about your diet today and progress on the research program so far if that's okay with you?"

Appendix A: FIT pilot session manuals and booster call manual

If No – “I’m sorry that I’ve caught you at a bad/busy time. When would be a good time to give you a call back?” (Write down availabilities on spreadsheet)

“Thank you, I’ll give you a call at xxx on xxx. Have a great day.”

“First of all; how are you getting on in terms of using imagery for working on your physical activity goal?”

“Is that what you expected?”

“Is there anything that surprised you?”

“How do you feel about that?”

“Great, it sounds like you are really getting into it.”

Or “That is ok, it will get easier, especially after working at it some more today. Well done for sticking with it.”

“Should we get started?”

“Could you tell me what you would like to change about your diet?” (Write down answers about diet changes) If participant mentions any information about changes to their diet that are unhealthy or not recommended, i.e. decrease all food intake below healthy levels, the researcher will discuss the ethical concerns with this goal and re-discuss the purpose of the research.

“Great, we can work on that in a moment.”

Imagery refresh: “You might have noticed for yourself over the past week that mental imagery can help us make decisions, and plan how we are going to get the things we want.”

“Imagining yourself fit and healthy, doing things you enjoy can help you to continue sticking with a new exercise routine for example.”

“But you can also use mental imagery to help make positive changes to your diet.”

“Research has shown that when we experience cravings for example sugary or high fat foods, we create a vivid image in our mind of that desired food item, we can smell it, even taste it.”

“Have you experienced something like this before?”

“And have you noticed how you feel when you try to resist that craving image?”

Appendix A: FIT pilot session manuals and booster call manual

“Vividly imagining how you will go about changing how you eat and imagining the positive consequences can help you beat cravings.”

“Is it ok with you if we continue to use mental imagery, to help you work out how you feel about your diet, and what you want to change?”

Elicit Imagery: “Great, let’s try another mental imagery exercise. This time, we will try an image of something that you will find enjoyable”

“For this exercise, some people like to imagine the smell of coffee or bread. What’s something you enjoy that you would like to imagine now?” (Use participants idea in imagery exercise)

“Ok, gaze off towards the wall, or close your eyes, and create that mental image now. Try to make it as vivid as you can, using all your senses like we did in the lemon image exercise a week ago.”

If bread or similar:

“Imagine the smell as vividly as you can.”

“Imagine what is happening—let the events unfold in your imagination.

“Focus on all your sensations—what you see, and hear, and feel.

If bread or similar:

“Maybe your mouth is watering as you focus on the image.”

FOR ALL Mental IMAGERY EXERCISES, make sure the participant does the Mental imagery exercise in their mind, and then describes it afterwards. (Record answers)

“How was that for you?”

“How vivid was the mental image, on a scale of 0 -10?” (“Whereas 0 means no image at all and 10 means very vivid”)

“What sensations did you have?”

“What did you enjoy about it?”

“Have you noticed that you have this kind of mental image when you are really hungry, or you really want to eat a snack?”

“Great job, now let’s think **about how we can** use imagery to help your diet.”

Goal directed imagery:

“You’ve been thinking about making some dietary changes?”

Appendix A: FIT pilot session manuals and booster call manual

"Can we start by thinking about your current diet. What do you like about it?"

"Are there any down-sides?" (Write them down. If they mention a generic issue or if it sounds like they are repeating what others say:)

"How has that affected you?"

If they have listed desired changes at the beginning: "You said there were several things you might try. Which one of those would you like to start with?"

If they have not stated anything in particular at the beginning: "Are there any changes you would like to make concerning what you eat?"

"Is there anything that would get better if you were to make those changes?"

"How would that affect you?" (write the positives down)

"Would you notice any changes even in the first week?"

(If no:) "Would any improvements be likely to happen in, say, a month?"

"Is there anything else you might notice?" (write down changes)

Summary "So you said that you don't like.... and that changing.... would (positives)...Is that right?"

With a potential thing that would get better, briefly elicit imagery:

"We are going to continue using imagery. So if you would like to make yourself comfy..."

"Let's imagine that you have succeeded at (use specifics if mentioned before or keep it general) changing your diet and being more active."

"Try to imagine how you will feel when that happens...visualise where you are...what is happening around you...how your body is feeling...and how you feel within yourself, emotionally."

"How does that feel?"

"Great, let's think about how you can get there. The steps you need to take to make this positive goal more concrete."

"Think about a particular time in the next days when you are working towards your diet goal... and imagine yourself (cutting down portion size, eating more veg and less sugary snacks etc...) to achieve your goal."

"Play it out, like you are the main character in your own mini-movie."

Appendix A: FIT pilot session manuals and booster call manual

"Imagine what happens leading up to you making that change...what happens while you are doing it... ..how it feels as you do it...what emotions you are feeling...and what you are doing afterwards..."

"Make it as real as you can."

"If your mind wanders, that's ok, bring your attention back to the image and keep playing it through."

"Now imagine further into the future...when you have been working towards your end goal, for maybe a few months, or a year. Think of a particular occasion, like a holiday or birthday...maybe you are on your own...maybe there are people around you...create that scene in your imagination."

"Imagine where you are...who is there...what you can see around you, and hear...how your body feels...maybe even what cloths you are wearing..."

"Remember to use all your senses, and make it as vivid as you can."

"Notice if those things that you thought would get better, got better..."

"How did that feel?"

"How vivid was the image, on a scale of 0-10, where 0 is no image at all and 10 is extremely vivid, as if it were actually happening to you?"

(Record on session rating scale and listen to any issues the person had with constructing the image.)

("Imagery gets more vivid with practise. Let's see if it did anything at all.")

"What part of that scenario did you enjoy the most?"

"What was so good about that?"

Self-efficacy

"I want you to think about that first image from today, those first steps you were imagining (towards your goal) PAUSE..."

"How confident are you that you could do that/make that change for at least a week? – Say, on a scale from 0- definitely can't do it, to 100% sure I can?" (Record rating/ if lower than 40%:)

"People often feel a bit unsure at first."

"We are going to look at some other things you can do to help you get started."

Appendix A: FIT pilot session manuals and booster call manual

(If higher than 40%:)

“Ok, so you are pretty confident already.”

Past successes

“Let’s see what happens when you think about that some more.”

“Have you ever tried this (action...diet...portion control etc...) to achieve your weight goals before?”

“What did you do then to make sure that it would happen?”

“Can you tell me a bit more...is there anything else you did?”

Emphasise aspects of success, even if the performance was not perfect. Even temporary behaviour changes can be counted as a ‘success’ (e.g. even if they only succeeded at adding more veg to their diet, but failed at cutting out sugar, or had 5 choc bars, instead of 6).

If they have not tried to change their diet before or don’t remember the first session when they talked about past success:

“Remember last time you told me you....”

“What did you do then to make sure that it would happen?”

“Can you tell me a bit more...is there anything else you did?”

Elicit past success imagery:

“Let’s re-create that memory in your imagination. Take yourself back to a particular time when you successfully [achieved goal].”

“Remember how it felt when you did that...”

“Play the memory out as if you were living it again. Remember to use all your senses.”

“How was that for you?”

Summarise ideas or use the good feeling they have just recreated....

“Could any of those ideas be used now to help you with (your diet goal)?”

“Let’s use that positive image and feeling of success.”

Appendix A: FIT pilot session manuals and booster call manual

"Let's imagine using it (or one of those ideas) in the next week or so, just to see if it could be helpful."

"Close your eyes and imagine yourself (using that idea) making use of that positive feeling to motivate you to work towards your goal."

"Imagine the first steps you need to take to get you started."

"Imagine you are succeeding at it..."

"And then imagine the next step in the sequence, the next step you would take."

"Imagine yourself doing each step as vividly as possible."

"Imagine what is happening around you—let the events fully unfold in your imagination."

"Focus on all your sensations—what you see, and hear, and feel."

"Focus on how good it feels to succeed."

Overcoming barriers Help them to identify any potential barriers to implementation of the strategy.

"As you were imagining that, were there any parts where something might get in the way that might stop you from reaching your goal?"

"What would you do about that?"

If cravings are identified as a barrier, or were mentioned at the beginning of the session, lead into **cravings buster exercise**:

'Please imagine one of the snacks you like and imagine holding it in your hand, looking at it right now- have you got an image?'

'Good, make it as vivid as you can, using all your senses...can you almost taste it?'

'Now please make a conscious effort to switch to your end goal imagery (e.g. to you wearing that beautiful dress at your daughter's wedding in a few months)...just for a few seconds indulge in that scenario, the finale of your own movie.'

'Have you got the image?'

'Great, sorry to bring you back now, but I have to ask: What happened to the chocolate... (bar/crisps)?')

Appendix A: FIT pilot session manuals and booster call manual

“Okay, great. Now try imagining yourself taking those first steps again to change (that about your eating/drinking), but also imagine doing those things you just mentioned, so it really happens.”

“Keep an eye out for things that may get in your way and how you will overcome them.”

“Focus on how you feel about that. Focus on your emotions, and physical sensations.”

“Now keep playing that image through to later that day or night. You’ve managed to stick to your goal of ... [goal]....”

“Imagine how good you feel.”

“See the positive effects.”

Self-efficacy

“How confident are you now that you could do that for the next weeks? – On the same scale from 0- definitely can’t do it, to 100% sure I can?”
(Record rating/ if higher than earlier:)

“That’s great! You are more confident than before. Just imagining past success and how you can use those ideas to succeed again helped you.”

(If above or around 60%)

“Wow- that’s great. Sounds like you’re pretty confident.

(If around 40-59%)

“That’s fine for getting started. You don’t have to be 100% confident- you just need enough to take the first step.”

(If under 40%)

“Confidence often gets stronger once people see what they can do. Is that enough for you to at least take a first step?”

Plan for the next few days

“What do you plan to do now, about changing your diet?”

[if needed, prompt with:]

“How will you get started with that?”

“What will you do, to stay in control?”

Appendix A: FIT pilot session manuals and booster call manual

“Sounds like you’ve thought that through.”

“Can you imagine doing that over the next weeks and imagine how good it will feel, working towards your goal...?”

Practice using physical activity and diet imagery

“Now I want you to roll out your private movie once more. Go through all the steps you need to take to work towards your diet goal.”

“But this time try to incorporate your physical activity goal into the sequence as well.”

“Imagine the next few days and the steps you will take to work on...(diet change), but also actively integrate the familiar steps you go through to work on your activity goal.”

“Please take your time and really envision each step in that sequence....as you let your day roll out in your imagination...”

“Play it through as vividly as you can, keep an eye out for things that could get in the way.”

“Notice how you overcome those hurdles.”

“Imagine how good it will feel to succeed.”

“How was that for you?” (Reassure doubt)

Review of session

“Was today helpful?”

“Would you be able to practice what we’ve done in the two sessions over the next weeks?”

“Do you have any questions? Is anything unclear at this stage?”

Make booster call appointment.

3. FIT pilot booster call

“Hi there it’s Linda from Plymouth University. How are you doing?”

“That’s great. Are you still available for around 15 minutes to discuss how you are getting on with working on your activity and weight loss goal?”

“First of all, I’d like to talk a bit about how it has been- working on your physical activity levels and diet recently, since you started the research study”.

Appendix A: FIT pilot session manuals and booster call manual

Elicit some detail:

“How has using mental imagery been for you over the past weeks?”

“Is that what you expected?”

“How many times a day do you usually use it?”

“What kind of situations are you using it in?”

“Is there anything that’s changed or that’s different in terms of healthy eating or activity levels since we last talked?” (Write down anything that may be useful in the later discussion of motivation or plans)

IF YES

“What have been the positive effects of being more active? And about making some changes to the way you eat?”

“What strategies did you use to achieve that?”

“Great, it sounds like things are really going your way. Well done.”

“Are you thinking about adding another activity or increasing the time spent being active now?”

“Have you considered making some additional changes to how you eat/cook or shop?”

“Is there anything that would get better when making those changes?”

“Ok, great; let’s imagine doing those things the next week or so, just to see if it could be helpful.”

Engage in imagery:

“Think about a particular time in the next few days when you are working towards your goal... and imagine yourself (cutting down portion size, eating more veg and less sugary snacks, running more etc...) to achieve your goal.”

“Play it out, like you are the main character in your own mini-movie.”

“Imagine the first steps you will take to make sure those things really happen...what happens leading up to you making that change”

“Imagine how you will succeed at that...”

Appendix A: FIT pilot session manuals and booster call manual

“And then imagine each scene that follows...what happens while you are doing it... how it feels as you do it...and what you are doing afterwards...what emotions you are feeling afterwards...”

“Make it as real as you can.”

“If your mind wanders, that’s ok, bring your attention back to the image and keep playing it through.” (Help them to identify any potential barriers to implementation of the strategy)

“As you are rolling out your private movie keep an eye out for things that may get in the way of you working on your goal and imagine how you will overcome them.”

“How you will successfully work on your goal after all.”

“Now keep playing that image through to later that day or night. You’ve managed to stick to your goal of being more active and ... [diet goal]. Focus on how you feel about that. Focus on your emotions, and physical sensations.”

"Imagine how good you feel."

"See the positive effects."

“Now imagine further into the future...when you have been working on your end goal, for maybe a few months, or a year. Think of a particular occasion, like a holiday or birthday...maybe you are on your own...maybe there are people around you...create that scene in your imagination.”

“Imagine where you are. ...Who is there...what you can see around you, and hear...how your body feels...maybe even what clothes you are wearing...”

“Remember to use all your senses, and make it as vivid as you can.”

"Notice that those things that you thought would get better, got better..."
HOW DID THAT FEEL?

If no changes to activity levels or diet identify any partial successes and focus on those (e.g., ate less than usual, did a bit more walking than usual) and review original incentives (why), planned strategies (how) and past successes (wins)

“Sorry to hear that things haven’t been going so well. But what you are telling me (partial changes) is already a big step in the right direction, well done. It might be helpful if we reflect back on some of the things we covered in our sessions together”.

Appendix A: FIT pilot session manuals and booster call manual

“You were thinking about making a change because [summarise reasons for change] and you thought you might do this by [summarise planned strategies] and you knew you could do this because [summarise past successes]”.

“Have any of those things changed?”

Guide participant through doing mental imagery of one or more of those areas, based on participant's choice or which one may be most helpful based on the participant's circumstances.

“Think about a particular time in the next few days when you are working towards your goal... and imagine yourself (cutting down portion size, eating more veg and less sugary snacks, running more etc...) to achieve your goal.”

“Play it out, like you are the main character in your own mini-movie. Imagine going through all the steps successfully.”

“Imagine each scene...what happens leading up to you making that change...what happens while you are doing it...and what you are doing afterwards...”

“...how it feels as you do it...what emotions you are feeling afterwards...”

“Make it as real as you can.”

“If your mind wanders, that's ok, bring your attention back to the image and keep playing it through.”

“Now imagine further into the future...when you have been working towards your end goal, for maybe a few months, or a year. Think of a particular occasion, like a holiday or birthday...maybe you are on your own...maybe there are people around you...create that scene in your imagination.”

“Imagine where you are. ...Who is there...what you can see around you, and hear...how your body feels...maybe even what clothes you are wearing...”

“Remember to use all your senses, and make it as vivid as you can.”

“Notice that those things that you thought would get better, got better...”

“How did that feel?”

Identify barriers to use of mental imagery

Appendix A: FIT pilot session manuals and booster call manual

“Is there anything making it difficult for you to use mental imagery?” (Record answer)

If yes, identify barriers, problem solve for how they might be overcome and guide participant through imagining implementing plan.

For All: Identify upcoming risk situations: “Are there any risky situations coming up that might be challenging for sticking to your goal? Or have there been times you’ve been feeling more challenged with your goal than other times?”

Guide the participant through problem solving for risky or difficult situations and **guide them through using mental imagery in that situation.**

Advise participant to review the material from the face-to-face session and encourage them to engage support (e.g., GP, family members) if they haven’t already done this.

Briefly summarise the session

“Excellent. That’s all I had to ask you today. Thank you very much for your time today. A quick summary of what we have discussed today,”

“Does that sound okay?”

If Yes: Thank for their time, **If No:** Adjust summary...

“Is there anything that you would like to discuss about the research study?”

Encourage ongoing use of mental imagery

“Thank you for your participation so far. I would like to encourage you to continue to use mental imagery in your own time. Remember to practise when (behaviour or reminder) and that like any skill it will get easier and stronger with frequent practise.”

Book call with participant in two weeks

“Lastly, I would like to organise a time with you to complete the second booster telephone call for the study. Just a reminder that your second booster call shouldn’t take any longer than 10-15 minutes and we will discuss similar things to what we have done today. When would be a good time to give you a call in around two weeks?”

Appendix B: RCT manuals and booster call manual

FIT session 1 physical activity/or diet (manual wording physical activity, delivered face to face)

Introduction

“Thank you for coming in today and for volunteering to take part in this study. If you have any questions or concerns during this session, please feel free to ask at any time.”

“Are you happy for me to audio record our session today? It is just a record for myself to make sure everyone gets the same treatment. The recordings will not be used for any other purpose or listened to by anyone, but myself or my supervisors and you can ask to have your recording destroyed at any time of the trial.”

“I would also like to let you know that you are free to stop this session at any time and withdraw any other data that you have provided.”

“And if there is anything that makes you feel uncomfortable in today’s session, please let me know and we can just skip that part.”

“I’m looking forward to hearing about your experiences but before we get into that would it be ok if I let you know first which of the treatment groups you have been allocated to and what that means?”

“You have been allocated to the Functional Imagery Training group. What this means is that we will have two sessions where can talk about your weight and what, if anything, you want to do about it, and some ideas for how you can make a change if you want to. One of those sessions will be here today, and the next one will happen by phone in a week’s time. We’ll then have booster calls. Functional Imagery Training is based on new research showing how mental imagery can strengthen motivation and help people achieve their goals. Do you have any questions about any of that?”

‘What led you to sign up for this study?’

“Do you already have an idea of what you want to do?”

“Where does physical activity fit with your goal?” (If not already stated)

“Is it OK if we pick this up again a bit later? I have a couple of questionnaires for you that will show us how your diet and activity levels are at the moment; if that is okay with you?” (IPAQ, FFQ)

“As you were filling in the questionnaires was there anything that surprised you about your diet?”

“And about how physically active you have been over the past week?”

“Is it OK if we just focus on the physical activity aspects of this today?”

MI part

“From what I understood earlier, you’ve been thinking about increasing your physical activity.”

“What do you think will get better/change if you increase your activity?”(Followed by reflection or exploration...)

“... Is there anything else?”

“What are the most important things that will get better?”

“Why is that really important?” Draw out importance or need, by reflections—e.g. it sounds like that is quite important to you.

“Okay, I understand. And what may happen, if you try to imagine, in the future if you don’t change anything?”

“Does that worry or concern you? ...Why?”

“You said earlier that there were a few things you might try to get started with being more physically active. Which one of those would you like to focus on today?”

Or if nothing specific was said: “Are there any specific changes you would like to make concerning how active you are, any ideas you may already have and like to pursue?”

“When you start working on your goal of xxx, would you notice any changes even in the first week?”

If no: “Would any improvements be likely to happen in, say, a month?”

“Is there anything else you might notice, in yourself or other areas of your life?”

Imagery intro

“Before we move on to discussing how you’re feeling about how active you are at the moment; I’d like to talk to you about mental imagery because it is a key part of this intervention. I’d like to introduce mental imagery and show you how it can be useful to help change your physical activity levels, if you don’t mind?”

“Mental Imagery is the ability to experience objects, people, activities and events by creating an internal scene in our mind, using our imagination. We often use mental imagery in our day to day lives. Do you ever notice yourself using imagery?”

“Have you noticed how when you read a story you often imagine how a character looks and moves; how they might feel to touch or what their voice could sounds like?”

“Do you ever create a mental image of something that you would like to do in the future?”

If no: “That is ok, I will do some exercises later on that will further explain imagery and help you make use of it.

If yes: “Great. We are going to work on training that ability so you can use it to help you achieve your goal. Today and throughout the program I would like to use the things we’ve learned about imagery, to support you in making your life the way you want it to be. We will practise using imagery at various times throughout this session. Can I show you what it is all about?”

“Gaze off towards the wall as you imagine the image. You can close your eyes if you like or leave them open. Please try and use all your senses when you are imagining the scene I will be describing.”

Lemon Exercise – Imagery Practice

“I am now going to ask you to imagine a situation. Please imagine it happening to yourself, as if you were there, and it was happening right now. Imagine as vividly as possible”.

(Pause for about 3s at each)

“OK, Let’s start.”

I want you to imagine holding a lemon...

Picture it as vividly as you can, what it looks like, the texture of the skin, whether there is any stem...

Whether the colour is the same across the whole lemon...is there any light or shade on it...

Imagine holding it close up, so you can see every feature...

Imagine what the texture of the lemon feels like...

The weight of the lemon in your hand...Its shape...

What it would feel like if you threw it upwards and caught it...

Keep the picture of the lemon there in your imagination....

Imagine holding the lemon next to your nose. That fresh, tangy smell...

Now, imagine cutting it with a knife. Think about how the knife feels, as you grip it and carefully cut the lemon in two. You might hear a slight rasping sound as you do that...

Small drops of juice come out as you cut it...maybe your hand feels a little wet...

Imagine what the halves look like—the segments, the texture of the inside of the lemon, white pith...

Imagine wiping your finger across the surface, and putting a drop on your tongue. A fresh, and acidic taste. Imagine swallowing it, and feeling it going down your throat. A cool, refreshing sensation.

Now, imagine taking one of the lemon halves in your hand. You have a glass in your other hand, and you are going to squeeze the juice into the glass...Squeezing it now, and the juice is trickling out...You can hear it going into the glass...Take a sip of the juice, and swallow that...

Go back to squeezing the lemon into the glass...

(Speak quickly, more loudly) Now it squirts into your eye! It is stinging you! (Look for a reaction—do they wince? – if they do: “Did you notice that you winced then?”)

“Tell me how all of that felt.” (Pause for a response)

“How vivid was the image, on a scale of 0-10?”

“Were there any aspects you found particularly real?”

“This is the sort of thing I mean, when I am asking you about your imagery. Not just what pictures you see, but also any imagined taste, sound, or smell, or feeling you have when you think about a situation.”

“Now we are going to look at how you can use imagery for motivation.”

Summary “So you said earlier that [insert negatives about not being physically active] and that [insert positives about increasing activity]. Is that right?”

With a potential thing that would get better, briefly elicit imagery:

“So we are going to continue using imagery, if you don’t mind. If you would like to make yourself comfy and find a point to gaze at...”

“Let’s imagine that you have succeeded at (use specifics if mentioned before or keep it general) becoming more active/at achieving your diet goal.”

“Try to imagine how you will feel when that happens...visualise where you are...what is happening around you...how your body is feeling....and how you feel within yourself, emotionally.”

“How does that feel?”

“Great, let’s think about how you can get there. The steps you need to take to make this positive goal more concrete.”

“Think about a particular time in the next few days and imagine yourself doing the (activity) you are going to do to achieve your goal/ or if diet: working on your diet goal.”

“Play it out, like you are the main character in your own mini-movie or a TV ad.”

“Thinking about those first few days, imagine what happens leading up to the activity/you making the change...what happens while you are doing it and how it feels as you do it...”

“...and what happens afterwards...how it feels afterwards...what emotions you are feeling...”

“Make it as real as you can.”

“If your mind wanders, that’s ok, bring your attention back to the image and keep playing it through.”

“Now imagine further into the future...when you have been working towards your goal, for maybe a few months, or a year. Think of a particular occasion, like a birthday or a holiday and create that scene in your imagination.” If they already mentioned something earlier, use it.

“Imagine where you are...who is there...what you can see around you, and hear...how your body feels...”

“Remember to use all your senses, and make it as vivid as you can.”

“Notice if those things that you thought would get better, got better...”

“How vivid was the image, on a scale of 0-10, where 0 is no image at all and 10 is extremely vivid, as if it were actually happening to you?”

Record on session rating scale and listen to any issues the person had with constructing the image. If they had trouble, say something like:

“It can sometimes be hard at first to use imagery- it gets more vivid with practise. Let’s see if it had any impact at all.”

“What part of that scenario did you enjoy the most?” ---“What was so good about that?”

Self-efficacy “I want you to think about that first image, those first steps you were imagining (towards your goal) PAUSE...”

“How confident are you that you could do that for at least a week? – Say, on a scale from 0- definitely can’t do it, to 100% sure I can?”
(Record rating/ if lower than 40%)

“People often feel a bit unsure at first. We are going to look at some other things you can do to help you get started.”

(If higher than 40%)

“Ok, so you are pretty confident already.”

Past successes

“Let’s see what happens when you think about that some more.”

“Have you ever tried this (action/change in diet...swimming...running etc.) to achieve your physical activity/ diet goals before?”

Emphasise aspects of success, even if the performance was not perfect. Even temporary behaviour changes can be counted as a ‘success’ (e.g. even if they only increased their physical activity for a week).

If they have not tried to increase their activity before:

“Have you succeeded in something else that needed willpower, like studying, training for an event, learning to drive or learning to play a musical instrument or language that you have succeeded at?”

Elicit past success imagery:

“What did you do then to make sure that it would happen?”

“Can you tell me a bit more...is there anything else you did?”

“Let’s re-create one of those memories in your imagination.”

“Take yourself back to that time when you successfully [achieved goal (any)/ or achieved increasing physical activity/changing your diet in particular, if available].”

“Play the memory out as if you were living it again. Remember to use all your senses.”

PAUSE

“Remember how it felt when you did that...” (Note down strategies)

“Please tell me how all of that felt and what happened?”

“So you achieved (your other goal) by (summarise strategies)”

“Could any of **those ideas be used now** to help you ... [reach your goal]?”

Elicit imagery:

“Let’s choose one of those ideas and imagine using it in the next week or so, just to see if it could be helpful.”

“Close your eyes and imagine yourself using that idea to help you get more physically active/change your diet.”

“Imagine the first steps you will take to increase your activity/to change your diet.”

“And then imagine the next step in the sequence, the next step you would take...using all of your senses.”

“Imagine how you will succeed/what you will do to succeed...”

“Let the events unfold in your imagination.”

“Focus on all your sensations—what you see..., and hear..., and feel...”

Overcoming barriers

Help them to identify any potential barriers to implementation of the strategy.

“As you were imagining that, were there any parts where something might get in the way that might stop you from reaching your goal?”

“What would you do about that?”

Elicit imagery:

“Okay, great. Now try imagining yourself taking those first steps again to getting more active, but also imagine doing those things you just mentioned, so it really happens.”

“This time keep an eye out for things that may get in your way and how you will overcome them.”

“How you will successfully work on your goal after all.”

“Now keep playing that image through to later that day or night. You’ve managed to stick to your goal of ... [goal]. Focus on how you feel about that. Focus on your emotions, and physical sensations.”

"Imagine how good you feel."

"See the positive effects."

Self-efficacy

“How confident are you now that you could do that for at least a week? – On the same scale from 0- definitely can’t do it, to 100% sure I can?”

(Record rating/ if higher than earlier)

“That’s great! You are more confident than before. Just imagining past success and how you can use those ideas to succeed again helped you.”

(If above or around 60%) “Wow- that’s great. Sounds like you’re pretty confident.

(If around 40-59%) “That’s fine for getting started. You don’t have to be 100% confident- you just need enough to take the first step.”

(If under 40%) “Confidence often gets stronger once people see what they can do. Is that enough for you to at least take a first step?”

Plan for the next few days:

“What do you plan to do now, about the amount of physical activity you get?”

[if needed, prompt with] “How will you get started with that?”

“What will you do, to stay on track?”

“Is there anyone who could help you with follow-through over the next few weeks?”

“People tend to find it easier to achieve their goals when they tell others about what they wish/plan to do.”

“Sounds like you’ve thought that through.”

Elicit brief imagery:

“Now imagine doing that over the next week and imagine how good it will feel to be working on your goal...” PAUSE

Practice using imagery cues

“Was using imagery today helpful?”

If no, perhaps say something like: “Don’t worry. Imagery is like any other new skill that becomes stronger and more helpful over time.”

[If yes:] “How did it help?”

“In fact, it will work best if you practice a lot, like anything really!”

“It doesn’t have to be for long. And you can do it while you are doing other things. In fact, it will remind you to practice, if you get in the habit of practicing at the same time as a very frequent behaviour, like having a drink, making a cup of tea or going up a flight of stairs.”

“Which behaviour do you think would be a good reminder for you?”

“Can we practice imagery while doing another task right now?” Take them to a sink or hand them a bottle of water and a glass to pour a drink of water.

Elicit imagery:

“Now I want you to roll out that private movie you have created in your mind as vividly as you can. Go through all the steps you will take to work on your goal. Make use of the ideas you told me so that it really happens.”

“Work around things that might get in the way.”

“And then imagine how good it will feel to succeed.”

“How was that for you?” Reassure doubt

“If there is a difficult situation coming up, where you might be likely to forget practicing your imagery, you might also want to set a reminder on your mobile phone. Or you could stick a note on your mirror or fridge at home to remind you to practice.”

“Is there a time tomorrow, where you’d like to have a reminder to practice the imagery?” **[If yes, get them to set that reminder]**—if it is a recurring issue, ask them to consider having a recurring reminder on their phone for the next few days].

“In fact we have an app you can download free of charge called ‘Goal in mind’. It has a mini-FIT session audio on it to help refresh what we have practiced today and you can set one goal per day, follow your progress and record FIT practices if you wish.”

“Would you like me to show you the app and provide you with the download link?”

Review of session

“Would you be able to practice what we’ve done over the next week?”

“And I will be talking to you, on the phone, at the end of that first week and do some more practise with you if that is ok?”

“When you are practicing your imagery, really focus on the positive outcomes and how you will feel and remember those times you’ve been successful in the past”

“Try to run through scenarios in your head where there might be obstacles to overcome; imagine how you will face these obstacles to achieve your goal, and how you will feel when you do.”

“Do you have any questions?” Make a phone appointment and remember to note down phone number!

FIT RCT session 2, diet and or physical activity (wording diet, later both, delivered by phone)

“Hi xxx, It’s Linda from Plymouth University. How are you today?”

“That’s wonderful. I’m calling in regards to the weight-loss trial you are enrolled in. Are you still available to do your second session of imagery training with me now? It shouldn’t take any longer than 50 minutes.”

If Yes – “That’s wonderful. Thank you for your time. I’d like to talk to you about your diet today and progress on the research program so far if that’s okay with you?”

If No – “I’m sorry that I’ve caught you at a bad/busy time. When would be a good time to give you a call back?”

“Thank you, I’ll give you a call at xxx on xxx. Have a great day.”

“Are you somewhere comfortable and quiet?”

“First of all; how are you getting on in terms of using imagery for working on your physical activity goal?”

“Is that what you expected?”

“Is there anything that surprised you?”

“How do you feel about that?”

“Great, it sounds like you are really getting into it.”

Or “That is ok, it will get easier, especially after working at it some more today.”

“What is making it hard for you to work on your goal at the moment?”

If it's not going well, you need to take a few minutes to help them address the issues.

Reinforce the fact that they have been trying, and look for signs of partial success.

Reframe the experienced difficulties as a learning experience.

Check that they still see the same benefits of change and see if they are still committed.

If they are, help them find a solution to the issue they experienced, and develop a new plan.

“Are you using the app at all?”

If yes: “Did you know you can upload your own motivational photos to the library and look at them while playing the audios or whenever you feel like you need a boost?”

If no: “Okay, it sounds like you don't need any extra help with your practises and goal pursuit. Just so you know, it is always there for you to download if you change your mind.”

“You mentioned you were also thinking about making some changes to your diet?”

“Great, could you tell me a bit more about that?”

Write down answers. If participant mentions any information about changes to their diet that are unhealthy or not recommended, i.e. decrease all food intake below healthy levels, briefly give information in an objective, non-judgmental way.

“Great, we can work on that in a moment.”

Imagery refresh: “You might have noticed for yourself over the past week that mental imagery can help us make decisions, and plan how we are going to get the things we want.”

“Imagining yourself fit and healthy, doing things you enjoy can help you to continue sticking with a new exercise routine for example.”

“But you can also use mental imagery to help make positive changes to your diet.”

“Research has shown that when we experience cravings for example sugary or high fat foods, we create a vivid image in our mind of that desired food item, we can smell it, even taste it.”

“Have you experienced something like this before?”

“Vividly imagining how you will go about changing how you eat and imagining the positive consequences can help you beat cravings.”

“Is it ok with you if we continue to use mental imagery, to help you work out how you feel about your diet, and what you want to change?”

MI part

“From what I understood earlier, you’ve been thinking about making some changes to your diet.”

“What do you think will get better if you do that?” (Followed by reflection or exploration...)

“... Is there anything else?”

“What are the most important things that will get better?”

“Why is that really important?”

Draw out importance or need, by reflections—e.g. it sounds like that is quite important to you. Or if necessary, by questions: Can use the ones you already have—e.g.

“Okay, I understand. And what may happen, if you try to imagine, in the future if you don’t change anything?”

“Does that worry or concern you? ...Why?”

“You said earlier that there were a few things you might try. Which one of those would you like to start with?”

Or if nothing specific was said: “Are there any specific ideas you may already have and like to pursue?”

“When you start working on your goal of xxx, would you notice any changes even in the first week?”

If no: “Would any improvements be likely to happen in, say, a month?”

“Is there anything else you might notice, in yourself or other areas of your life?”

Summary

“So, you said that you don’t like.... and that changing.... would (positives)...Is that right?”

With a potential thing that would get better, briefly elicit imagery:

“We are going to continue using imagery. So, if you would like to make yourself comfy...”

“Let’s imagine that you have succeeded at (use specifics if mentioned before or keep it general) changing your diet and being more active.”

“Try to imagine how you will feel when that happens...visualise where you are...what is happeningaround you...how your body is feeling...and how you feel within yourself, emotionally.”

“How does that feel?”

“Great, let’s think about how you can get there. The steps you need to take to make this positive goal more concrete.”

“Think about a particular time in the next days when you are working towards your diet goal... and imagine yourself (cutting down portion size, eating more veg and less sugary snacks etc...) to achieve your goal.”

“Play it out, like you are the main character in your own mini-movie.”

“Imagine what happens leading up to you making that change...what happens while you are doing it... ..how it feels as you do it...what emotions you are feeling...and what you are doing afterwards...”

“Make it as real as you can.”

“If your mind wanders, that’s ok, bring your attention back to the image and keep playing it through.”

“Now imagine further into the future...when you have been working towards your end goal, for maybe a few months, or a year. Think of a particular occasion, like a holiday or birthday...maybe you are on your own...maybe there are people around you...create that scene in your imagination.”

“Imagine where you are...who is there...what you can see around you, and hear...how your body feels...maybe even what clothes you are wearing...”

“Remember to use all your senses, and make it as vivid as you can.”

“Notice if those things that you thought would get better, got better...”

“How did that feel?”

“How vivid was the image, on a scale of 0-10, where 0 is no image at all and 10 is extremely vivid, as if it were actually happening to you?”

(Record on session rating scale and listen to any issues the person had with constructing the image.)

(“Imagery gets more vivid with practise. Let’s see if it did anything at all.”)

“What part of that scenario did you enjoy the most?”

“What was so good about that?”

Self-efficacy “I want you to think about that first image from today, those first steps you were imagining (towards your goal) PAUSE...”

“How confident are you that you could do that/make that change for at least a week? – Say, on a scale from 0- definitely can’t do it, to 100% sure I can?”

(Record rating/ if lower than 40%:)

“People often feel a bit unsure at first.”

“We are going to look at some other things you can do to help you get started.”

(If higher than 40%:)

“Ok, so you are pretty confident already.”

Past successes “Let’s see what happens when you think about that some more.”

“Have you ever tried this (action...diet...portion control etc...) to achieve your weight goals before?”

“What did you do then to make sure that it would happen?”

“Can you tell me a bit more...is there anything else you did?”

Emphasise aspects of success, even if the performance was not perfect. Even temporary behaviour changes can be counted as a ‘success’ (e.g. even if they only succeeded at adding more veg to their diet, but failed at cutting out sugar, or had 5 choc bars, instead of 6).

If they have not tried to change their diet before or don’t remember the first session when they talked about past success:

“Remember last time you told me you....”

“What did you do then to make sure that it would happen?”

“Can you tell me a bit more...is there anything else you did?”

Elicit past success imagery: “Let’s re-create that memory in your imagination. Take yourself back to a particular time when you successfully [achieved goal].”

“Remember how it felt when you did that...”

“Play the memory out as if you were living it again. Remember to use all your senses.”

“How was that for you?”

Summarise ideas or use the good feeling they have just recreated.... “Could any of those ideas be used now to help you with (your diet goal)?”

“Let’s use that positive image and feeling of success.”

“Let’s imagine using it (or one of those ideas) in the next week or so, just to see if it could be helpful.”

“Close your eyes and imagine yourself (using that idea) making use of that positive feeling to motivate you to work towards your goal.

"Imagine the first steps you need to take to get you started."

"Imagine you are succeeding at it..."

"And then imagine the next step in the sequence, the next step you would take." "Imagine yourself doing each step as vividly as possible."

"Imagine what is happening around you—let the events fully unfold in your imagination."

"Focus on all your sensations—what you see, and hear, and feel?"

"Focus on how good it feels to succeed."

Overcoming barriers Help them to identify any potential barriers to implementation of the strategy.

"As you were imagining that, were there any parts where something might get in the way that might stop you from reaching your goal?"

"What would you do about that?"

"Okay, great. **Now try imagining yourself** taking those first steps again to change (that about your eating/drinking), but also imagine doing those things you just mentioned, so it really happens."

"Keep an eye out for things that may get in your way and how you will overcome them."

"Focus on how you feel about that. Focus on your emotions, and physical sensations."

"Now keep playing that image through to later that day or night. You've managed to stick to your goal of ... [goal]...."

"Imagine how good you feel."

"See the positive effects."

If they identify cravings as a problem guide them through a 'cravings buster' exercise: *Get them to create an image of their usual craving, e.g. crisps or chocolate. Then instruct them to switch to diet change imagery, whatever they might do instead of giving into craving and how good they will feel when they manage to do this or get them to switch to their personal end goal imagery. Emphasise how good they will feel. Ask them what happened to their chosen image- to demonstrate how it has vanished or weakened.*

Self-efficacy

"How confident are you now that you could do that for the next weeks? – On the same scale from 0- definitely can't do it, to 100% sure I can?"

(Record rating/ if higher than earlier:)

"That's great! You are more confident than before. Just imagining past success and how you can use those ideas to succeed again helped you."

(If above or around 60%)

"Wow- that's great. Sounds like you're pretty confident."

(If around 40-59%)

"That's fine for getting started. You don't have to be 100% confident- you just need enough to take the first step."

(If under 40%)

"Confidence often gets stronger once people see what they can do. Is that enough for you to at least take a first step?"

Plan for the next few days

"What do you plan to do now, about changing your diet?"

[if needed, prompt with:] "How will you get started with that?"

"What will you do, to stay in control?"

"Sounds like you've thought that through."

“Can you imagine doing that over the next weeks and imagine how good it will feel, working towards your goal...?”

Practice using physical activity and diet imagery

“Now I want you to roll out your private movie once more. Go through all the steps you need to take to work towards your diet goal.”

“But this time try to incorporate your physical activity goal into the sequence as well.”

“Imagine the next few days and the steps you will take to work on...(diet change), but also actively integrate the familiar steps you go through to work on your activity goal.”

“Please take your time and really envision each step in that sequence....as you let your day roll out in your imagination...”

“Play it through as vividly as you can, keep an eye out for things that could get in the way.”

“Notice how you overcome those hurdles.”

“Imagine how good it will feel to succeed.”

“How was that for you?” (Reassure doubt)

Review of session “Was today helpful?”

“Would you be able to practice what we’ve done in the two sessions over the next weeks?”

“Are you still happy to practise imagery in conjunction with the behaviour/activity you had nominated previously?”

“When food cravings arise, use that as an opportunity to do an emergency run through your private movie. To help you overcome that obstacle”

“Remember that if there is a difficult situation coming up, where you might be likely to forget practicing your imagery, set a reminder on your mobile phone...

... or stick a note somewhere like your bathroom mirror, so you see it when you brush your teeth for example.”

“It will work best if you practice a lot!”

“When you are practicing your movie, really focus on the positive outcomes and how you will feel.”

“Remember those times you’ve been successful in the past.”

“Try to run through scenarios in your head where there might be obstacles to overcome; imagine how you will face these obstacles to achieve your goal, and how good you will feel when you do. (And use the cravings buster imagery exercise we have done together to help you in moments of temptation).”

“Do you have any questions? Is anything unclear at this stage?”

Make booster call appointment.

FIT RCT booster call manual

“Hi there it’s Linda from Plymouth University. How are you doing?”

“That’s great. Are you still available for around 10 minutes to discuss how you are getting on with working on your activity and weight loss goal?”

“First of all, I’d like to talk a bit about how it has been- working on your physical activity levels and diet recently, since you started the research study”.

Elicit some detail:

“How has using mental imagery been for you over the past weeks?”

“Is that what you expected?”

“How many times a day do you usually use it?”

“What kind of situations are you using it in?”

“How are you getting on with the app?”

“Did you know you can attach your own photos to the practise audios if you like?”

“Is there anything that’s changed or that’s different in terms of healthy eating or activity levels since we last talked?” (Write down anything that may be useful in the later discussion of motivation or plans)

IF YES

“What have been the positive effects of being more active? And about making some changes to the way you eat?”

“What strategies did you use to achieve that?”

“Great, it sounds like things are really going your way. Well done.”

“Are you thinking about adding another activity or increasing the time spent being active now?”

“Have you considered making some additional changes to how you eat/cook or shop?”

“Is there anything that would get better when making those changes?”

“Ok, great; let’s imagine doing those things the next week or so, just to see if it could be helpful.”

Engage in imagery:

“Think about a particular time in the next few days when you are working towards your goal... and imagine yourself (cutting down portion size, eating more veg and less sugary snacks, running more etc...) to achieve your goal.”

“Play it out, like you are the main character in your own mini-movie.”

“Imagine the first steps you will take to make sure those things really happen...what happens leading up to you making that change”

“Imagine how you will succeed at that...”

“And then imagine each scene that follows...what happens while you are doing it... how it feels as you do it...and what you are doing afterwards...what emotions you are feeling afterwards...”

“Make it as real as you can.”

“If your mind wanders, that’s ok, bring your attention back to the image and keep playing it through.” (Help them to identify any potential barriers to implementation of the strategy)

“As you are rolling out your private movie keep an eye out for things that may get in the way of you working on your goal and imagine how you will overcome them.”

“How you will successfully work on your goal after all.”

“Now keep playing that image through to later that day or night. You’ve managed to stick to your goal of being more active and ... [diet goal]. Focus on how you feel about that. Focus on your emotions, and physical sensations.”

"Imagine how good you feel."

"See the positive effects."

“Now imagine further into the future...when you have been working on your end goal, for maybe a few months, or a year. Think of a particular occasion, like a holiday or

birthday...maybe you are on your own...maybe there are people around you...create that scene in your imagination.”

“Imagine where you are. ...Who is there...what you can see around you, and hear...how your body feels...maybe even what clothes you are wearing...”

“Remember to use all your senses, and make it as vivid as you can.”

"Notice that those things that you thought would get better, got better..."

HOW DID THAT FEEL?

If no changes to activity levels or diet identify any partial successes and focus on those (e.g., ate less than usual, did a bit more walking than usual) and review original incentives (why), planned strategies (how) and past successes (wins)

“Sorry to hear that things haven’t been going so well. But what you are telling me (partial changes) is already a big step in the right direction, well done. It might be helpful if we reflect back on some of the things we covered in our sessions together”.

“You were thinking about making a change because [summarise reasons for change] and you thought you might do this by [summarise planned strategies] and you knew you could do this because [summarise past successes]”.

“Have any of those things changed?”

Guide participant through doing mental imagery of one or more of those areas, based on participant’s choice or which one may be most helpful based on the participant’s circumstances.

“Think about a particular time in the next few days when you are working towards your goal... and imagine yourself (cutting down portion size, eating more veg and less sugary snacks, running more etc...) to achieve your goal.”

“Play it out, like you are the main character in your own mini-movie. Imagine going through all the steps successfully.”

“Imagine each scene...what happens leading up to you making that change...what happens while you are doing it...and what you are doing afterwards...”

“...how it feels as you do it...what emotions you are feeling afterwards...”

“Make it as real as you can.”

“If your mind wanders, that’s ok, bring your attention back to the image and keep playing it through.”

“Now imagine further into the future...when you have been working towards your end goal, for maybe a few months, or a year. Think of a particular occasion, like a holiday or birthday...maybe you are on your own...maybe there are people around you...create that scene in your imagination.”

“Imagine where you are. ...Who is there...what you can see around you, and hear...how your body feels...maybe even what clothes you are wearing...”

“Remember to use all your senses, and make it as vivid as you can.”

"Notice that those things that you thought would get better, got better..."

“How did that feel?”

Identify barriers to use of mental imagery

“Is there anything making it difficult for you to use mental imagery?” (Record answer)

If yes, identify barriers, problem solve for how they might be overcome and guide participant through imagining implementing plan.

For All: Identify upcoming risk situations: “Are there any risky situations coming up that might be challenging for sticking to your goal? Or have there been times you’ve been feeling more challenged with your goal than other times?”

Guide the participant through problem solving for risky or difficult situations and guide them through using mental imagery in that situation.

Advise participant to review the material from the face-to-face session and encourage them to engage support (e.g., GP, family members) if they haven't already done this.

Briefly summarise the session

"Excellent. That's all I had to ask you today. Thank you very much for your time today. A quick summary of what we have discussed today,"

"Does that sound okay?"

If Yes: Thank for their time, **If No:** Adjust summary...

"Is there anything that you would like to discuss about the research study?"

Encourage ongoing use of mental imagery

"Thank you for your participation so far. I would like to encourage you to continue to use mental imagery in your own time. Remember to practise when (behaviour or reminder) and that like any skill it will get easier and stronger with frequent practise."

Book call with participant in two weeks

"Lastly, I would like to organise a time with you to complete the second booster telephone call for the study. Just a reminder that your second booster call shouldn't take any longer than 10-15 minutes and we will discuss similar things to what we have done today. When would be a good time to give you a call in around two weeks?"

MI session 1 physical activity/or diet (wording physical activity, delivered face to face)

Introduction/Collaboration

"Thank you again for coming in today and for volunteering to take part in this study. If you have any questions or concerns during this session, please feel free to ask at any time."

"Are you happy for me to audio record our session today? It is just a record for myself to make sure everyone gets the same treatment. The recordings will not be used for any

other purpose or listened to by anyone, but myself or my supervisors and you can ask to have your recording destroyed at any time of the trial.”

“I would also like to let you know that you are free to stop this session at any time and withdraw any other data that you have provided.”

“And if there is anything that makes you feel uncomfortable in today’s session, please let me know and we can just skip that part.”

“I’m looking forward to hearing about your experiences but before we get into that would it be ok if I let you know first which of the treatment groups you have been allocated to and what that means?”

“You have been allocated to the Motivational Interviewing group. What this means is that we will have two sessions where can talk about your weight and what, if anything, you want to do about it, and some ideas for how you can make a change if you want to. One of those sessions will be here today, and the next one will happen by phone in a week’s time. We’ll then have booster calls. Motivational Interviewing is widely used in other weight management settings and there is a lot of research showing it is effective. Do you have any questions about any of that?”

Evocation/Supporting Autonomy

“What led you to sign up for the study?”

Spend a couple of minutes just with reflective statements, and at some point/s focusing on the extent of emotion in their statements—e.g. so you feel that you really need to make a change.

If they give “sustain” statements—e.g.... but I don’t think I can do it—at this point, reflect that back, (but if possible, reversing the order—e.g. so you’re still unsure about whether you can do it, but you’re keen to make a change), and if they repeat their concern, say that that is an issue that we can talk about more, later in this interview if they want.

“Is it OK if we pick this up again a bit later? I have a couple of questionnaires for you that will show us how your diet and activity levels are at the moment; if that is okay with you?”
(IPAQ, FFQ)

“As you were filling in the questionnaires was there anything that surprised you about your diet?”

“And about how physically active you have been over the past week?”

“Is it OK if we just focus on the physical activity aspects of this today?”

Use their responses to develop discrepancy

Elicit hypothetical goal:

If there is sustain talk, continue with “tell me more about your experiences with your weight”

When there is change talk, summarise the discussion and ask

“what do you think you want to do?”

If resistance, reinforce that this conversation is hypothetical and they do not have to commit to any decisions.

Reinforce their autonomy, expressing that what they choose to do is entirely up to them.

Develop discrepancy:

“What do you think will be different if you increase your activity/change that about your diet?”(Followed by reflection or exploration...)

“... Is there anything else?”

Draw out importance or need, by reflections—e.g. it sounds like that is quite important to you.

“What may happen in the future if you don’t change anything?”

“Does that worry or concern you? ...Why?”

Or go to, e.g.

“What are the most important things that will get better?”

“Why is that really important?”

Self-talk/Preparation:

“Would you mind summarising the things that are likely to get better if you change your behaviour?”

“When you think about that list of things, how does it make you feel?”

“It sounds like (reason x) is really important to you.

“Why is that important to you now?” (Unless already covered)

Action: “So, in thinking about all this, what goal might help you get these positive changes?”

If they have not stated anything in particular at the beginning:

“Are there any specific things you could do to become more active/change your diet?”

If multiple potential actions have already been given, or are given in response to the last question:

“You said that you were thinking about... [list the thing/s they said they wanted to consider doing]. Which one of those would you like to talk about now?”

“How do you feel about that goal now?”

If they volunteer that they want to do this, but can't:

“So you aren’t sure if you can do it yet, but...

Give a reflection relating to need or desire—e.g. ...you think that would help you get partway to [a key outcome].

Support self-efficacy: Past successes

“Shall we see what happens when you think about that some more?”

(Reword the following into a reflection if they have already told you how much they did it):

“Have you ever tried [this action...e.g. swimming 6 laps every day/ cutting down portion size] before?”

Emphasise aspects of success (e.g. “That’s impressive”), even if the performance was not perfect. Even temporary behaviour changes are successes (e.g. “For 4 weeks!” “You did that every day!” etc.).

If they have not tried to increase their activity before: “Have you done something else that needed willpower, like studying, training, learning to drive or learning to play a musical instrument or learning a language?”

Elicit strategies they used:

“How did you make sure you did it?”

“Can you tell me a bit more...is there anything else you did?” (Note down strategies)

“So you [reached the goal—e.g. “kept going to the gym each day for a whole month”] by [summarise strategies]”

“Could any of those ideas be used now to help you ... [reach the goal]?”

Elicit commitment, if they are ready:

“So, what do you think you will do?”

If they reply as “could”, see if they want to commit to anything now.

If they are not quite ready to commit to a change:

“What would it take before you were ready to [make the change]?”

Go back to exploration of reasons to change or supporting their solution of a self-efficacy problem as needed.

Creating a specific plan, if they are now committed:

“So, what exactly will you do, to get started?”

[If needed, prompt with:] “When will you do that?”

“What will be the next steps?”

“Will there be anything that might get in the way, or make it harder to get started?”

“What will you try to make sure you follow your plan for the next week?”

“Is there anyone who could help you follow it through?”

(Affirm) “Sounds like you’ve thought that through.”

“Would you like to write that down so you have a summary to take away?” Hand them work sheet

“If you need a bit of a boost to your motivation over the next few days, you could try reading that over to remind yourself about what you said.”

Conclusion

“Is there anything else we need to talk about before you can get started?”

(Make phone appointment for next session, and end with an affirmation)

“It really sounds like you’re committed to doing this, and that you’ll be able to carry that through. I look forward to hearing all about it on [next session day]”

MI session 2 diet and/or physical activity (wording diet, later both, delivered by phone)

Collaboration/Affirmation:

“How are you getting on in terms of working on your physical activity goal?”

“How do you feel about that?”

“Great, it sounds like you are really getting into it.”

Or “That is ok; it will get easier, especially after working at it some more today. Well done for sticking with it.”

“What is making it hard for you to work on your goal at the moment?” If it’s not going well, you need to take a few minutes to help them address the issues.

Reinforce the fact that they have been trying, and look for signs of partial success.

Reframe the experienced difficulties as a learning experience.

Check that they still see the same benefits of change and see if they are still committed.

If they are, help them find a solution to the issue they experienced, and develop a new plan.

Evocation/Supporting Autonomy

“You mentioned you were also thinking about making some changes to your diet?”

“Great, could you tell me a bit more about that?”

Write down answers. If participant mentions any information about changes to their diet that are unhealthy or not recommended, i.e. decrease all food intake below healthy levels, briefly give information in an objective, non-judgmental way.

Develop discrepancy/ Self-talk/Preparation:

“What positive outcomes might changing your diet have?”(Followed by reflection or exploration...)

“... Is there anything else that might get better?”

Draw out importance or need, by reflections—e.g. it sounds like that is quite important to you.

Or if necessary, by questions: Can use the ones you already have—e.g.

“And what do you think might happen if you don’t make some changes at all?”

“Does this worry you?”

“What do you feel are the most important things that will improve along with your diet and physical activity changes?”

“Why is that really important?”

“Would you mind repeating the important things that are likely to get better if you change your behaviour back to me once more?”

“When you think about that list of things, how does it make you feel?”

“Reason x sounds particularly important to you.”

“Why do you think that is?” (Unless already covered)

Action:

“So, in thinking about all this, what diet goal might help you get these positive future outcomes you were talking about?”

If they have not stated anything in particular at the beginning:

“Are there any specific things you could do to be healthier in your diet?”

If multiple potential actions have already been given, or are given in response to the last question:

“You said that you were thinking about... [list the thing/s they said they wanted to consider doing]. Which one of those would you like to speak about today?”

“How do you feel about that goal now?”

If they volunteer that they want to do this, but can't:

“So you aren't sure if you can do it yet, but...

(Give a reflection relating to need or desire—e.g. ...you think that would help you get/ get partway to [a key outcome]?)

Summary:

“So, you said that [insert negatives about not changing diet at all] and that [insert positives about changing diet]. Is that right?”

Plan steps/Overcoming barriers: Help them to identify any potential barriers to implementation of the strategy

“Let's see if we can make this as specific as we can — what steps would you need to take and when?”

“What things might make this change hard for you?”

“What things might be particularly challenging?”

“What ideas do you have for how you could deal with that?”

Support self-efficacy: Past successes

“Let's see what happens when you think about that some more.”

“Have you ever tried this (change) to achieve your diet goals before?”

Emphasise aspects of success, even if the performance was not perfect. **Even temporary** behaviour changes can be counted as a 'success' (e.g. even if they only cut sugar intake for a week).

If they have not tried to change their diet before: "Have you succeeded in something else that needed willpower, like studying for a test or saving up for a holiday?"

"What did you do then to make sure that it would happen?"

"Can you tell me a bit more...is there anything else you did?"

"So you achieved (your other goal) by (summarise strategies)"

"Could any of those ideas be used now to help you ... [reach your goal]?"

"Think about going along with your plan over the next week. Chances are it will be a bit harder at some times than others. Is there a time in the next few days that may be a bit harder?"

"Tell me about that."

"Is there anyone who could help you with follow-through over the next few weeks?"

"People tend to find it easier to achieve their goals when they tell others about what they wish/plan to do."

Self-efficacy

"How confident are you now that you could do that for at least a week? – On the same scale from 0- definitely can't do it, to 100% sure I can?"

Plan for the next few weeks

"What do you plan to do now, about your diet?"

"Sounds like you've thought that through."

“Would you like another goal sheet to write down what you just told me and you can review this and your physical activity goals and reason when you feel you need a little extra motivation?”

Review of session

“Would you be able to stick to your planned diet changes over the next week?”

“Do you have any questions?” (Make phone appointment for next session)

MI booster call manual

“Hi there it’s Linda from Plymouth University. How are you doing?”

“That’s great. Are you still available for around 15 minutes to discuss how you are getting on with working on your activity and weight loss goal?”

“First of all, I’d like to talk a bit about how it has been- working on your physical activity levels and diet recently, since you started the research study”.

“Is that what you expected?”

“Is there anything that surprised you?”

“How do you feel about that?”

Write down anything that may be useful in the later discussion of motivation or plans

“Is there anything that’s changed or that’s different in terms of healthy eating or activity levels since we last talked?”

IF YES “What have been the positive effects of being more active?”

“And about making some changes to the way you eat?”

“What strategies did you use to achieve that?”

“Great, it sounds like things are really going your way. Well done.”

“Are you thinking about adding another activity or increasing the time spent being active now?”

“Have you considered making some additional changes to how you eat/cook or shop?”

“Is there anything that would get better when making those changes?”

If NO changes to activity levels or diet since first face-to-face session or since starting the study, identify any partial successes and focus on those (e.g., ATE less than usual, did a bit more walking than usual, etc.)

Review original incentives (why), planned strategies (how) and past successes (wins)

“Sorry to hear that things haven’t been going so well. Let’s reflect back on some of the things we covered in our session together”.

“You were thinking about making a change because [summarise reasons for change] and you thought you might do this by [summarise planned strategies] and you knew you could do this because [summarise past successes]”.

“Have any of those things changed?”

“Is there anything making it difficult for you to stick to your plans?”

Identify upcoming risk situations

“Are there any risky situations coming up that might be challenging for sticking to your plans? Or have there been times you’ve been feeling more challenged with your activity and diet goals than other times?”

“What could you do about that?”

“Advise participant to review the material from the face-to-face session and encourage them to engage support (e.g., GP, family members) if they haven’t already done this.”

Briefly summarise the session

“Excellent. That’s all I had to ask you today. Thank you very much for your time today. A quick summary of what we have discussed today,..”

“Does that sound okay?”

If Yes: “Thank for their time.”

If No: Adjust summary

Check if participant wishes to raise or discuss any other issues

“Is there anything that you would like to discuss about the research study?”

Book call with participant in two weeks

“Lastly, I would like to organise a time with you to complete the second booster telephone call for the study. Just a reminder that your second call shouldn’t take any longer than 10-15 minutes and we will discuss similar things to what we have done today. When would be a good time to give you a call in around two weeks?”

Additional exercises

Plateau exercise:

Please note that the ‘Plateau’ exercise is the same for MI group without focusing on imagery and on verbal discussion and reflection instead. There is no ‘Cravings buster exercise’ for the MI group.

Script for periods of slow results (including imagery): Plateau exercise

It is normal for progress to be slower at some times than others. For example, weight loss slows after the initial weeks as the body adjusts to a new diet. This slowing can be discouraging and it is important to reassure the client that it is normal. Focus on the other rewards of the new patterns of behaviour that they are establishing – the client may not have lost any weight but perhaps they are feeling healthier or more energetic. If the client feels there is nothing more they can do towards their goal – they cannot reduce their calorie intake further or have no time to exercise more often – then it may be helpful to find other ways of strengthening their ‘ideal self’. For example, if they wanted to lose weight so they could keep up with their children better, focus on other things they can do to work towards their ideal parent goal, for example planning an activity together or setting aside time to play a board game.

The reasoning is that closer the client gets to being their ‘ideal self’, the less they will want to engage in activities that contradict that self. Imagery brings them closer to that self in their mind, and by doing so makes that ideal a stronger motivator.

How have you been getting on?

I’ve been eating healthily and sticking to my exercise plan but I still weigh the same as a few weeks ago. It doesn’t seem to be working any more.

You are frustrated that you aren’t seeing the results at the moment but you are still exercising and eating well, which is great. It is normal for weight loss to slow down at this point because your body is adjusting to the changes you have made. Compared with [3 months ago], how do you feel in yourself?

[reflect back positives, like healthier or more energetic] Could even do an imagery exercise: imagine how you were 3 months ago, then imagine how you feel now, notice the differences, notice how [things that are better]. Really focus on how good that feels.

If it is going well, stop at this point. If person still feels demotivated, continue with:

Would you like to try a new exercise to help keep you motivated while your body adjusts?

[if no, reassure that this one has nothing to do with diet or weight loss and see if they assent then]

You told me that you wanted to lose weight because [reasons]. Is that still the case?

[yes]

Let’s have a think about other things you can do to work towards that goal.

FIT (only) Cravings Buster exercise:

If cravings are addressed at any stage as a barrier to goal pursuit take client through cravings buster exercise:

Due to limited working memory capacity visual spatial imagery will interfere directly with craving imagery, helping the client to combat the craving instantly.

‘Please imagine one of the snacks you like and imagine holding it in your hand, looking at it right now- have you got an image?’

‘Good, make it as vivid as you can, using all your senses...can you almost taste it?’

‘Now please make a conscious effort to switch to your end goal imagery (e.g. to you wearing that beautiful dress at your daughter’s wedding in a few months) just for a few seconds indulge in that scenario, the finale of your own movie.’

‘Have you got the image?’

‘Great, sorry to bring you back now, but I have to ask: What happened to the chocolate... (bar/crisps)?’

Appendix C: FIT fidelity checklist for RCT

Fidelity Check for MI-style used in FIT:

Please rate for each session on a 1-5-point scale whereas 1: Never, 2: Rarely, 3: Sometimes, 4: Often, 5: Always

1-5 ratings	Rating	Behaviour counts	Rating
Evocation		Giving information	
Collaboration		Closed Question	
Autonomy/ support		Open question	
Direction		Simple reflection	
Empathy		Complex reflection	
		MI adherence	
		Asking permission pre advice or info	
		Affirming	
		Emphasising control	
		Support--compassion	
		Non-adherent	
		Advising without permission	
		Confronting	
		Directing	

For FIT parts: Rate 0 (absent) /1 (present) on the following 10 items:

Please note: Some imagery exercises (e.g. barriers, ‘cravings buster’), homework, feedback etc., are not always included in sessions, or reserved for later sessions. Please always evaluate in relation to the trial specific scripts

Appendix C: FIT fidelity checklist for RCT

and session order. Please enter n/a into the rating box if a section is not relevant to the script or session you are evaluating.

FIT sections are flexible and do not have to follow a rigid order; sections can be revisited and clarified further, or even repeated where need be/if it comes up.

Vividness and confidence rulers can be used at the therapist's leisure, more or less frequently than the scripts foresee.

MI part (evoking discrepancy, reflecting emotion): Recap of ideas expressed in welcome 'chat' followed by: Discussing upsides and downsides (hypothetical)	
Introduction to imagery followed by lemon exercise and vividness assessment	
Elicited implementation intention (hypothetical)	
Elicited imagery about success of hypothetical implementation intention	
Elicited imagery about more concrete plan/steps	
Elicited imagery about future positive effects of change/incentives	
Self-efficacy for goal is probed	
Elicited imagery about past successes unspecific to new goals, or specific to physical activity/dietary change	
<i>Please note below that imagery about using ideas/strategies and overcoming barriers can be covered within the same imagery exercise, sometimes naturally instigated by the participant. For example, they might notice something does not fit with the potential plan/idea and find a way around it before the therapist needs to probe. The therapist might also decide (when the</i>	

Appendix C: FIT fidelity checklist for RCT

<i>participant is quite confident already) not to interrupt them, but to go straight into a 'barriers' part.</i>	
Elicited imagery about using those ideas/strategies now	
Elicited imagery re coping strategies/solutions to potential issues with plan/overcoming barriers	
Self-efficacy assessment/possibly vividness assessment too	
Planning/commitment part (verbal)	
Elicited brief imagery of plan and good feeling of working on goals for the week	
Home practice of imagery encouraged, identify a frequent behaviour to pair imagery practise with.	
Practice of imagery alongside another task where possible.	
Encourage written and phone reminders for imagery	
App intro/demo and download option	
Review of session and participant's chance to ask further questions	

My goal



Appendix E: Plymouth Shopper RCT advertisement

...empty homes back into use including the former Job Centre in Hoegate Street as part of the objectives of the Plan for Empty Homes 2015-2019, which aims to bring 200 empty homes back into use by March 31 2019.

Through Octopus QSH's innovative 'rent-to-buy' scheme, tenants are able to save up to 10% of the purchase price and have the option to buy their properties within the first five years of living in their home with a deposit built up from the 50% rent paid over the five year period.

Those who do not purchase during this time can continue renting their homes on a 20 year assured short hold tenancy.

Councillor Chris Penberthy said: "I am really thrilled

that Octopus QSH are going to be bringing the former Ship Hostel back into use. The rent to buy option offers people the flexibility to ultimately buy the property if they are in a position to do so.

"Another recent initiative we have introduced to tackle the blight of empty homes is our monthly 'Empty Homes' surgery at 1st Stop in New George Street - anyone can pop in and let us know about an empty building that they would like to see brought back into use."

Kevin Harcock, construction director at Octopus QSH, said: "Receiving the green light to bring the former Ship Hostel building back into use is the result of hard work and dedication by all parties involved in this project, and is a testament to what can be achieved.

The former Ship Hostel in Stonehouse

"This latest scheme is a truly innovative and very different for affordable schemes, as the project will see the redevelopment and significant renovation of an old building back to its former glory - we look forward to getting started on site."

People are invited to register their interest in the new apartments by contacting South Devon Rural Housing Association on 01803 847591 or by email: steve@southdevonrural.com

• The Empty Homes Surgery takes place a Plymouth City Council's 1st Stop in New George Street on the first Wednesday of every month between 10am and 2pm.

Volunteers wanted for weight loss trials

Plymouth University is looking for adults who would be willing to take part in a weight loss trial.

They want to hear from people aged 18 and over who have a Body Mass Index (BMI) of 25 or more to take part in the trial which is called 'Personalised Health Intervention for Weight Loss and Increasing Physical Activity'.

The trial is being funded by the National Institute for Health Research in collaboration with Plymouth University.

The study will last six months and will involve two therapeutic sessions with a researcher - one face to face at the university and one telephone session.

The remainder of the study will involve brief booster phone calls every two weeks to help keep participants on track with their weight loss target.

On completion of the programme, participants will attend the university to be weighed and measured and receive a £15 bonus for taking part.

Anyone interested should contact Linda Solbrig on 07784 617079 or e-mail her at linda.solbrig@plymouth.ac.uk

Appendix F: Supplementary materials for chapter 6

Appendix F: Supplementary materials for chapter 5

Technical supplement to IJO analyses

Linda Solbrig, Ben Whalley, David J. Kavanagh, Jon May, Tracey Parkin, Ray Jones, Jackie Andrade

Introduction

This document provides supplementary information on the analysis in [REF IJO PAPER]. The tables and figures shown here are compiled from an [RMarkdown](#) source document, and so provides a complete account of the analyses reported in that paper (although note that for clarity, only short code excerpts describing the models are included in the final pdf).

Missing data

Patterns of data missing or lost-to-followup.

Count	age	cm1	cm2	cm3	gqol1	gqol2	kg1	kg2	kg3
112	x	x	x	x	x	x	x	x	x
2	x	x	x	.	x	x	x	x	.
7	x	x	.	.	x	.	x	.	.

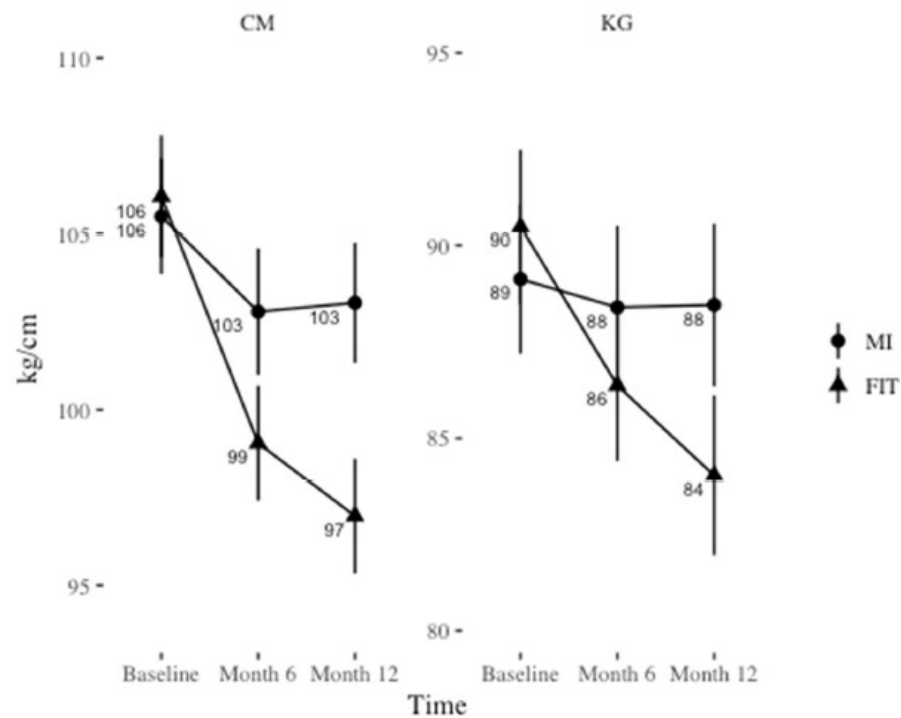
Comparison of groups at baseline

Baseline between-group comparisons (mean difference and t-statistic for continuous outcomes; odds ratio and z for binary variables; chisq for categorical variables).

Test	Difference/OR	Std. Error	Statistic	p
age ~ group	2.000	2.558	0.782	.436
bmi1 ~ group	0.408	0.988	0.413	.680
cm1 ~ group	0.567	2.397	0.236	.813
gqol1 ~ group	0.420	2.296	0.183	.855
kg1 ~ group	1.355	2.796	0.485	.629
female ~ group	0.944	1.511	-0.140	.889

Appendix F: Supplementary materials for chapter 6

Outcome models and plots



Unadjusted weight and waist circumference by group: mean and 95% confidence interval.

Our outcome models are defined like so:

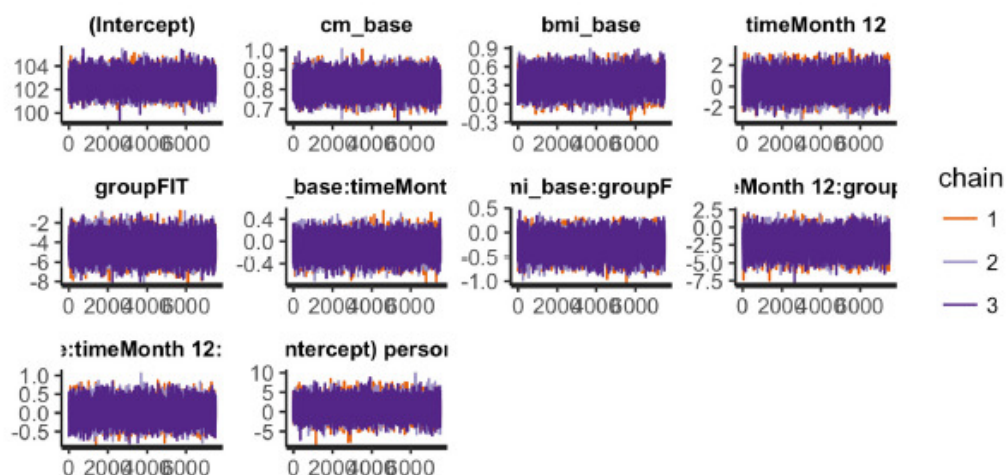
Model fitting is either by ML (using `lmer` or `lm`) or by MCMC (using `rstanarm`). With ML:

And with Stan via `rstanarm`, like so:

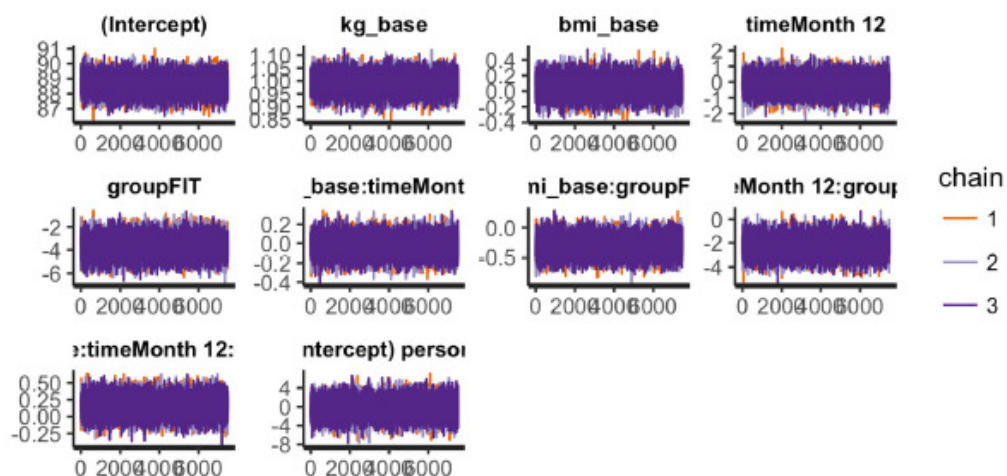
For mixed models we use the default, pessimistic and weakly-informative priors from `rstanarm`. The choice of $R^2 = .5$ for the GQOL model is based on expectation that R^2 would benefit substantially from baseline scores which are likely to be highly correlated (e.g. for weight). Setting R^2 location lower would tend to reduce model coefficients, but for a reasonable range of values (.2 to .8) does not change the inferences reported.

Appendix F: Supplementary materials for chapter 6

Diagnostic plots and statistics from MCMC model fits

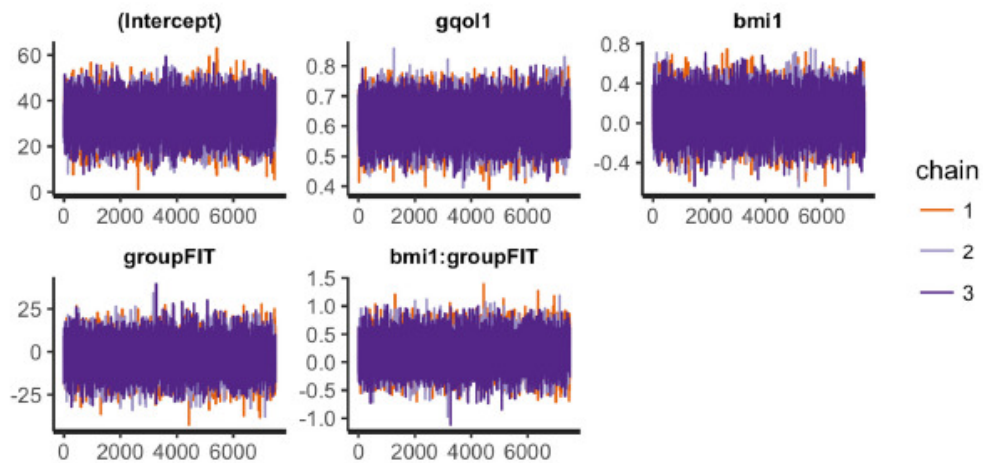


MCMC traces for CM model



MCMC traces for KG model

Appendix F: Supplementary materials for chapter 6



MCMC traces for GQOL model

Model convergence statistics averaged across model parameters with 95% CI. Note $mcse_scaled = mcse/sd$.

Outcome	Statistic	Mean	95% lower	95% upper
Cm	Rhat	1.000	1.000	1.000
Cm	mcse	0.014	0.010	0.019
Cm	mcse.scaled	0.007	0.007	0.007
GQOL	Rhat	1.000	1.000	1.000
GQOL	mcse	0.020	-0.002	0.041
GQOL	mcse.scaled	0.009	0.008	0.011
Kg	Rhat	1.000	1.000	1.000
Kg	mcse	0.012	0.009	0.015
Kg	mcse.scaled	0.007	0.007	0.007

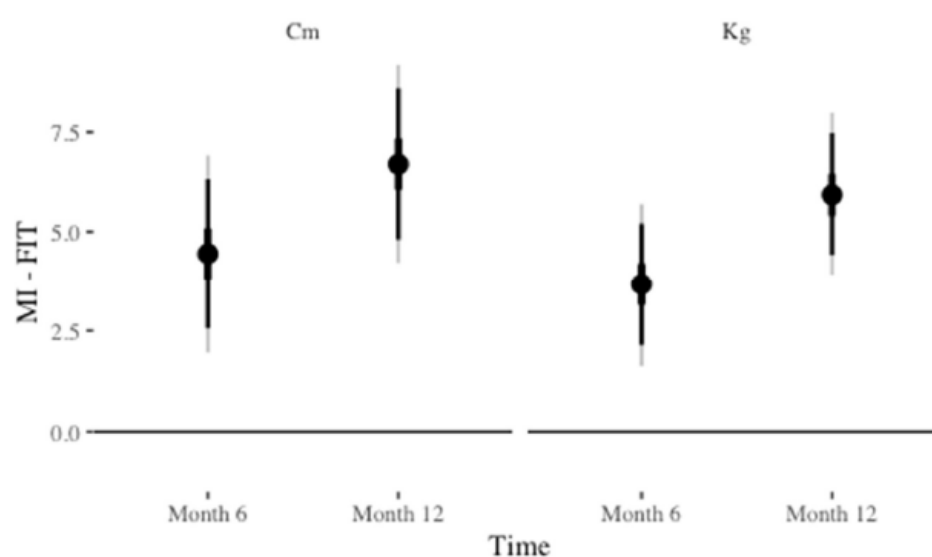
Average treatment effects

Average treatment effects are calculated from our ML models using the `lsmeans` package. For MCMC models, they are computed based on posterior linear predictions (i.e. predictions for the mean using `rstanarm::posterior_linpred`). Where we refer to predictions for individual, or for new patients, then these are based on full posterior predictions (using `rstanarm::posterior_predict`).

Appendix F: Supplementary materials for chapter 6

Between group contrasts (with Satterthwaite corrected degrees of freedom for Kg and Cm) and posterior mean differences (and 95% credible intervals) for the effect of FIT vs. MI at month 6 and 12.

Outcome	Follow up	FIT (mean)	FIT (sd)	MI (mean)	MI (sd)	df	t	p	Treatment effect (MCMC)	lower	upper
Cm	Baseline	106.07	13.75	105.50	12.51						
Cm	Month 6	99.05	12.61	102.78	13.37	205.4	-4.727	<.001	-4.444	-6.328	-2.560
Cm	Month 12	96.97	12.59	103.04	12.45	206.1	-7.012	<.001	-6.697	-8.602	-4.801
Kg	Baseline	90.48	15.90	89.13	14.76						
Kg	Month 6	86.37	15.07	88.39	15.72	161.5	-4.877	<.001	-3.670	-5.203	-2.139
Kg	Month 12	84.04	15.96	88.46	15.34	163.4	-7.707	<.001	-5.929	-7.482	-4.418
GQOL	Baseline	62.13	10.59	61.71	14.51						
GQOL	Month 6	75.81	11.66	72.53	10.42	109.0	2.107	.037	2.831	0.091	5.565

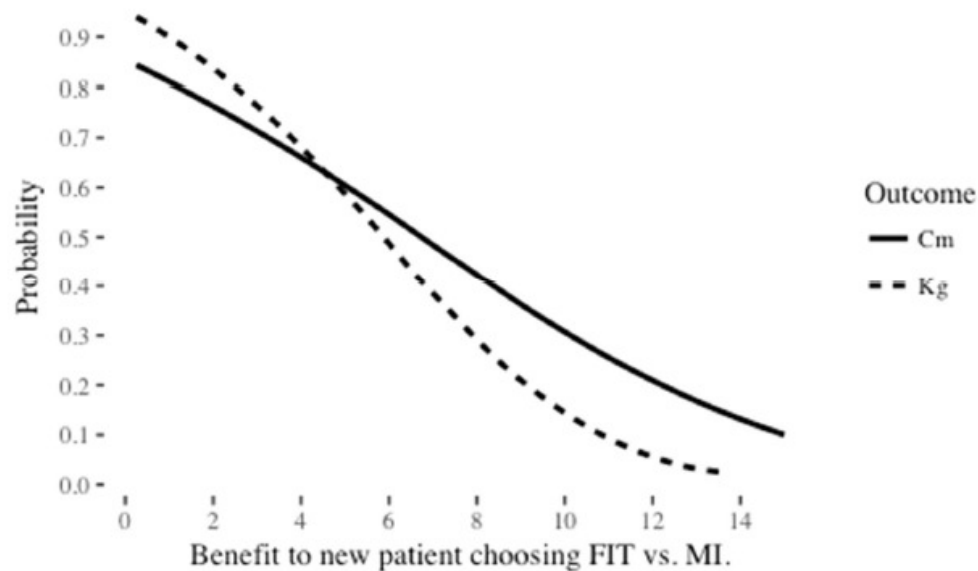


Average treatment effects and credible intervals for the FIT vs. MI difference; 50% (thick line), 95% (thin line) and 99% (grey line).

Appendix F: Supplementary materials for chapter 6

Average treatment effects and credible intervals for the FIT vs. MI difference; 50% (thick line), 95% (thin line) and 99% (grey line).

Predictions for individuals: Recasting results from the patient perspective

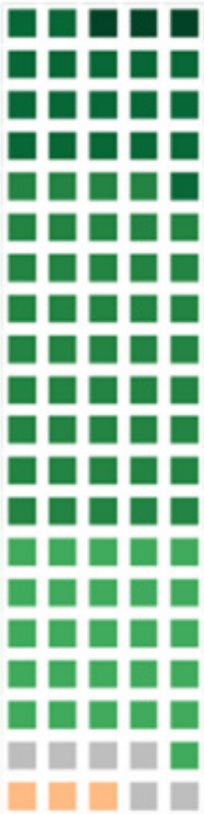


Appendix F: Supplementary materials for chapter 6

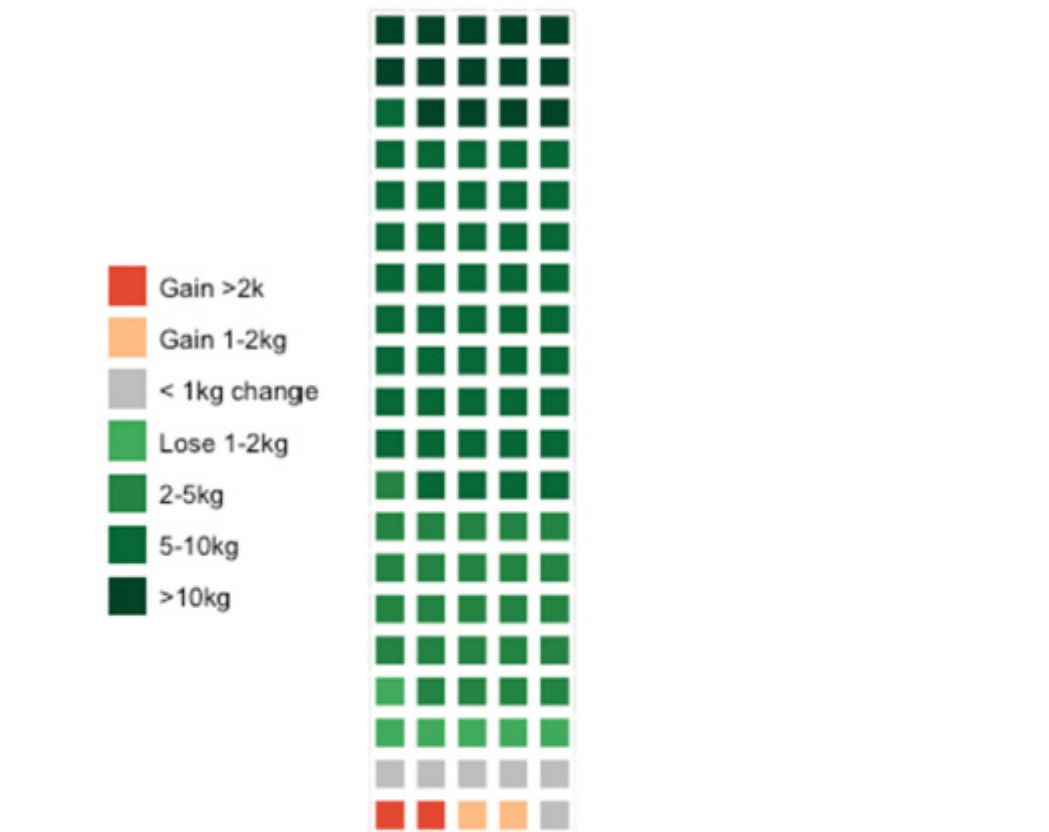
Supplementary table giving calculations for verbal descriptives of the effect of FIT vs. MI given in the text. Figures indicate probabilities for a benefit at least as good as the value in the Cm or Kg column.

Probability	Cm reduction	Kg lost
0.1	14.250	11.000
0.2	12.250	9.125
0.4	8.375	6.875
0.5	6.750	5.875
0.6	5.125	4.875
0.8	1.125	2.625
0.9	-1.125	0.750

- Gain > 5%
- Gain 1-5%
- < 1% change
- Lose 1-5%
- Lose 5-10%
- Lose 10-15%
- Lose > 15%

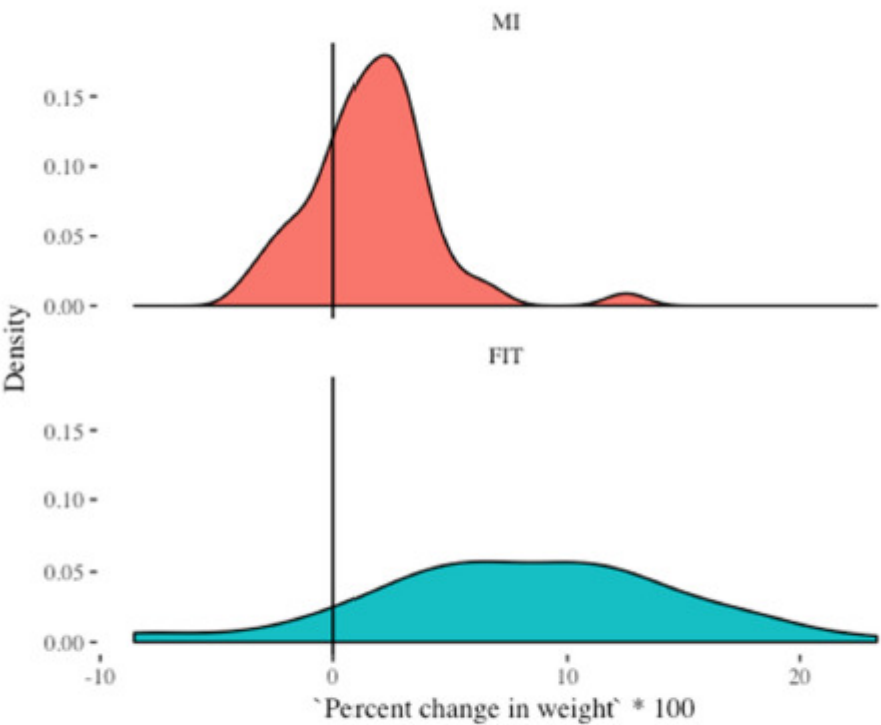


Appendix F: Supplementary materials for chapter 6



Change	%
Gain >2k	2
Gain 1-2kg	2
< 1kg change	6
Lose 1-2kg	6
2-5kg	25
5-10kg	45
>10kg	14

Appendix F: Supplementary materials for chapter 6



Percentage change in weight by group from baseline to followup (unadjusted).

Appendix G: Handbook

Functional Imagery Training

Practitioner's handbook

Jackie Andrade

Linda Solbrig

David Kavanagh



Functional Imagery Training

FIT is a new way of supporting behaviour change using mental imagery. This approach builds on two decades of research showing that mental imagery is more strongly emotionally charged than other types of thought.

Mental imagery is what gives cravings their dominance over other thoughts, and it can help us work successfully towards a new goal despite obstacles. FIT builds on this potential, showing people how to use imagery effectively in their everyday lives, to reach goals that they value.

FIT uses the empathic style of motivational interviewing to work in partnership with clients, helping them resolve dilemmas, find solutions, and develop strategies and confidence for achieving them.

However, it differs from motivational interviewing, in

- explicitly eliciting vivid mental imagery at each stage, and
- teaching people how to apply motivational imagery themselves using behavioural cueing, audios and an app to support imagery practice and build self-regulation.

FIT has been used to change eating habits, increase physical activity in the general community and in multiple sclerosis, support diabetic self-management, treat alcohol dependence, manage cannabis use in people with psychosis, and reduce self-harm. Its length is varied to suit these different contexts, and it can be delivered in face-to-face sessions or over the phone.

Eliciting imagery in FIT

Throughout FIT, encourage participants to create vivid emotive imagery that supports functional behavior change, while adhering to the collaborative and empathic spirit of motivational interviewing.

Ensure that participants focus on the positives and possibility of change—relief, satisfaction or pleasure from foreshadowed successes, and confidence in their ability to achieve them. Help them notice the emotions that the imagery elicits. (NB—imagery they practice at home should be about positive proximal benefits of change—not about negatives of current behaviour).

An initial rationale for using imagery will typically include giving participants an experience of imagery that illustrates its emotive power.

When creating later imagery:

- encourage participants to create images silently, and give them short periods of silence, to minimize verbal distraction from their experience.
- elicit multisensory imagery about specific events that they have experienced, or they can vividly imagine occurring.
- every few seconds, give them brief prompts to retain their attention, and draw their attention to
 - different senses (including bodily sensations),
 - different aspects of the event (where, when, what is happening, who is there), and
 - their emotional state.

Stages in Functional Imagery Training

1. Imagery-based motivational interviewing: Eliciting personal incentives

The questions below should not be seen as prescriptive, and they do not define FIT—they are examples only. Look for opportunities to use reflections to draw out or summarize similar responses where possible.

After brief discussion of factors supporting less functional current behavior (*without eliciting imagery*), elicit imagery concerning any areas of dissatisfaction.

Strengthen this motivation, e.g. by eliciting imagery about the future they will experience, if they do not change.

*e.g. How will things be in 5 (or 1) years' time if things stay the same?
Can you imagine that now? ...how does that feel?*

Evoke discrepancy between their current behaviour and their core values and goals.

*e.g. When you are at your best, what is that like? ...Imagine that happening now.
How does that fit with the way it would be if you didn't make any change?*

Draw attention to how hypothetical change could bring them closer to their valued goals and ideal self.

*e.g. Imagine it is a year in the future and you have been <making this change> for a whole year
...imagine a particular time when that is happening ...how does that feel?
...is that closer to the way you'd like things to be?
How about next (week/month)? What difference would you notice already? Imagine that happening now.*

2. Imagery-based motivational interviewing: Eliciting a plan and building self-efficacy

Help the person develop ideas about change into a concrete hypothetical plan that can be imagined vividly. Encourage them to contemplate proximal sub-goals for the next few days or weeks.

*e.g. What exactly would you do, to make that happen?
How would you get started? Imagine taking those first steps.*

*If you made a change, what would you do? How would you get started? Imagine taking those first steps.
... how did that feel?*

Build confidence by imagining past successes. Use these memories to give ideas for a current plan.

How confident are you, on a scale of 0 to 100, that you could <do this> for the next few days?

*e.g. Have you done something like this before—even for a short time?
(If no—have you done something else that was really hard?)*

Take yourself back to that time...relive the moment. ...how did that feel?

[Help them to celebrate the achievement, even if the attempt was only partially or transiently successful]

What did you do then, to make sure you could do it?

Have there been any other times you were able to do something like this? (How did you do it that time?)

Could you use those ideas to help you now? ...imagine doing that.

So, how about now--how confident are you, from 0 to 100, that you could <do this> for the next few days? (Draw attention to changes in the rating, and see if that is sufficient confidence to take an initial step).

Check whether ambivalence is resolved, and if the person is committed to starting to implement their plan now. If they are not yet ready to make a change, see if they are willing to use imagery to see what would need to be different, before they could commit. Consistent with the spirit of MI, back off if they are not wanting to commit to their primary goal. (See if they want to commit to another goal—any goal—since that will show them how to use imagery to attain it).

If the person is now committed to implementing the plan, see if they will make a recording of 3 statements of a sentence or less on their phone, which they can play back later:

- What I want to do
- Why I want to do it
- How I want to do it

Use imagery to elicit ideas about how they can address any potential obstacles to change. (*Take care not to undermine self-efficacy at this point*)

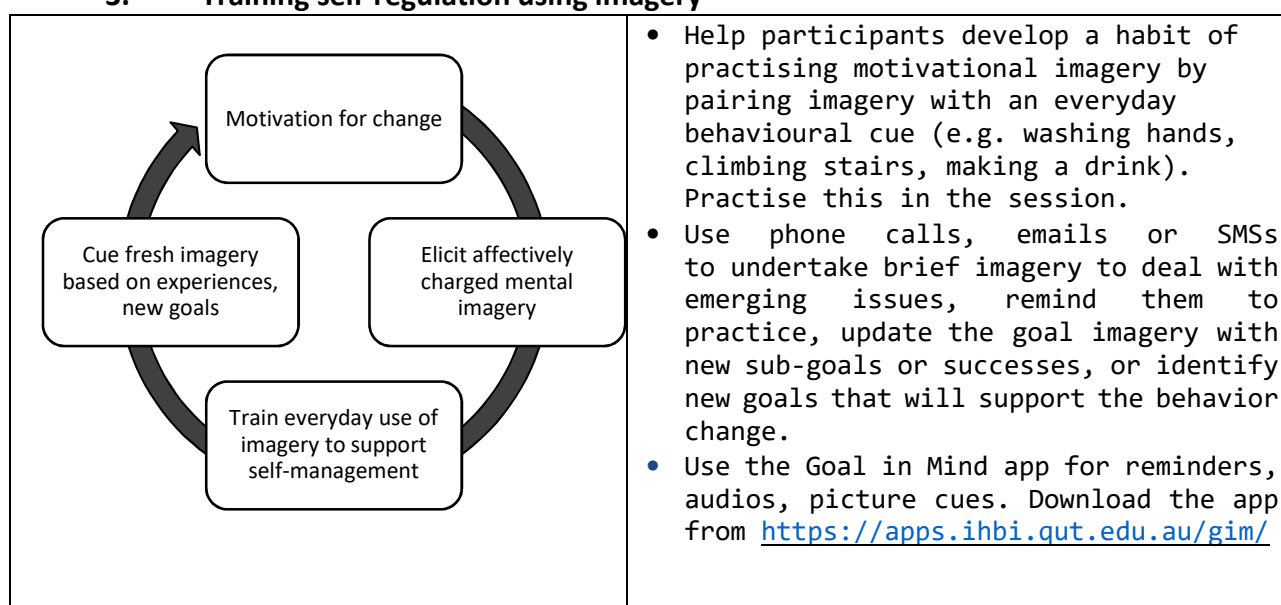
Imagine working towards your goal for a week...

While you were doing that imagery, did you notice anything that might get in your way?

How could you deal with that? ...Imagine trying that now.

In situations where cravings are a problem, show them how to train them to deliberately switch attention from craving imagery to goal imagery (*Craving Buster* technique).

3. Training self-regulation using imagery



Other techniques to support FIT

Mindfulness

Maintaining positive mood is central to FIT. If the initial stages of behaviour change elicit powerful *unhelpful* imagery, then mindfulness practice could help the individual to accept and ignore that imagery while developing awareness of other, pleasurable sensory perceptions of the environment around them.

Mindfulness audio download:

<http://blogs.plymouth.ac.uk/functionalimagerytraining/mindfulness/>

Imagery rescripting

The elicitation of positive, ideal-self imagery in FIT can be seen as a form of imagery rescripting in cases where an individual's view of their future self is quite negative. Imagery rescripting might also be helpful for individuals whose progress is hampered by a specific, distressing or traumatic image of a past event. If recollection of that event elicits significant guilt or shame that undermines the person's self-efficacy, we might use image rescripting as an intermediate step towards developing functional imagery of coping with obstacles on the path towards change. For example, we would help the individual to create an image of another person making the unwanted action, and to offer that person compassion. Then we would flip the image to a recurrence of the context, but where the person is coping effectively and avoiding the negative outcome.

Imagery-based cognitive therapy

Imagery can be used to help individuals test and change their cognitions about functional and dysfunctional behaviours. For example, if an individual has overly positive expectancies about drinking excessively, we might elicit images to help them relive past events or anticipate future events and evaluate more realistically the contribution of their drinking.

It is important to emphasise though, that at heart FIT is not about changing people's cognitions but about helping them to discover and enhance existing incentives and recalled successes.

Delivering FIT: Preliminaries

Getting the balance right between structure and flexibility

Structure is important in FIT. A well-structured FIT session with a therapist provides an essential stepping stone in the client's journey to becoming their own therapist.

However, FIT sessions should be adapted flexibly to fit each client's individual needs. Revisit a previous topic if you need to, and skip exercises that the client has already completed spontaneously.

It is important that sessions progress in tune with the client's readiness to move on. Move the conversation to the next stage only when the client is ready (listen for 'change talk') and gives permission when you ask, 'Would it be okay if we think about...?' If you sense resistance, affirm their autonomy and explore their dilemma or issue from another angle.

Essential elements of FIT

An *initial* session of FIT, usually lasting 45-60 minutes:

Uses imagery to

- explore the decisional balance, making incentives clear and vivid
- develop a hypothetical or actual action plan
- strengthen self-efficacy by applying successful past strategies to anticipated obstacles

Develops the individual's strategies for using motivational imagery outside therapy sessions.

Subsequent sessions may:

Use imagery to

- explore original incentives, particularly if motivation is wavering
- strengthen motivation and self-efficacy by evoking recent successes, even if partial
- help client adapt or strengthen action plans
- develop strategies for dealing with obstacles
- continue practising imagery at home

Things to remember

The essential structure of a session is DiPSOT:

Discrepancy	Plan	Successes	Obstacles	Training
--------------------	-------------	------------------	------------------	-----------------

To deliver it you need EAR:

Encourage imagery	Ask 'how was that?'	Reflect positive emotion
--------------------------	----------------------------	---------------------------------

Keep the tone positive so client is encouraged to continue using imagery by themselves. When reflecting or summarizing, start with negative and end with positive: '*You think it will be hard and that worries you, but you are really keen to try*'.

Step-by-step guide

Stages of FIT are colour-coded. *Illustrative questions are in italics. Imagery exercises are in bold. Imagery exercises with suggested wording are in bold italics.*

FIRST SESSION OF FIT

Protocol for 45-60 minute session + assessment time

Step 1: Welcome

Create comfortable environment

If appropriate, explain FIT briefly

Negotiate agenda for session: *What would you like to talk about?*

Do or discuss any assessments together

Introduce to multisensory imagery and use Lemon Exercise or similar example

Step 2a: Elicit motivation by building discrepancy

Recap decisional balance mentioned in step 1 to understand incentives and barriers

Explore downsides using imagery: *Imagine what that would be like, say in a year's time.*

Imagery of ideal self

How are things when they are going well? Or, how would you like things to be?

Imagine a specific time when you are like that

Imagine benefits of change

Imagine it is a year in the future and you have somehow made this change...[reflect how this brings closer to ideal self]

Step 2b: Strengthen motivation by focusing on past successes

The purpose of this step is to increase self-efficacy generally by recreating past successes using imagery. If the client has mentioned a positive past self in the previous step, then this step can be skipped. We return to past successes later.

Have you done this before? [If no, have you done something else that was hard?]

Using imagery, take yourself back to that time when you...re-live that moment

Step 3: Develop a plan

Explore ideas for change. Keep it hypothetical until the client is expressing readiness to change.

If you made a change, what sort of things could you do?

Would you like to try out some of those ideas using imagery?

How was that?

Find out what they would like to start with.

Let's look at that in more detail. What would you need to do to get started?

Imagine taking those first steps, what you need to do to get started, and what you do next, and after that. Imagine succeeding at each step. Play forward to a specific event in the future, when you have achieved your goal. Notice how those things that you thought would get better, have got better. Imagine how good you feel.

Check confidence. We do this again later to illustrate the motivating power of imagery, encouraging client to use imagery themselves.

How confident are you, on a scale of 0 to 100%, that you could do this for the next week?

Step 4: Strengthen self-efficacy for this specific plan

Have you tried something like this before? Or succeeded at something else that was difficult?

Using imagery, take yourself back to a time when you were successful at this

What did you do then to make it happen? Could any of the ideas you used in the past work now?

Imagine working towards your goal again. Imagine the first steps you will take, what you will do next, and after that. Imagine using your idea to help you succeed.

Step 5: Overcome barriers

*Let's imagine that again, but this time as you are playing through your day-
Let's imagine something gets in the way of you working on your plan and in your
imagination, find a way around this obstacle. You will succeed after all.*

Discuss barriers and solutions.

Rate confidence again:

Introduce Cravings Buster© if appropriate

Check confidence and draw attention to any increase. Encourage that it gets easier with practice

Step 6: Train imagery use outside of sessions

Like any skill, imagery works best if you practise regularly. Is there a behaviour that you do often during the day that could help remind you?

If possible, practice the daily cuing behaviour (or substitute) paired with personalized imagery in the therapy session. Ask how it felt.

Roll out that private movie you have created in your mind as vividly as you can. Go through all the steps you will take to work on your goal. Make use of the ideas you told me so that it really happens. Work around things that might get in the way. And then imagine how good it will feel to succeed.

Help client identify other reminders:

- Goal in Mind App.
- Imagery and mindfulness audios
- *If there is a difficult situation coming up, where you might be likely to forget practicing your imagery, you might also want to set a reminder on your mobile phone. Or you could stick a note on your mirror or fridge at home to remind you to practice.*

Set homework, such as making a video, or taking pictures related to their goal imagery.

Step 7: Review plan for the following week

Elicit commitment:

How will you get started with that once you leave here today? What will you do, to stay on track?

Is there anyone who could help you with follow-through over the next few weeks? People tend to find it easier to achieve their goals when they tell others about what they wish/plan to do.

Make next appointment

FIRST BOOSTER CALL SESSION

Protocol for 15 minute session

Step 1: Welcome

Create comfortable environment (phone delivery: Is client somewhere comfortable and quiet?)

How have things been going?

How has it been using imagery?

Help with any difficulty in using imagery by doing an imagery exercise, finding a better cuing behaviour, or assisting with technical difficulty in using the audios and app

If some progress towards goal:

Negotiate agenda, referring back to session 1 where appropriate, and proceed as follows.

If no progress, use 6 Rs:

- Reinforce the fact that they have been trying
- Reframe the experienced difficulties as a learning experience
- Reassure that it will get easier after working at it some more today
- Review original incentives
- Revise if necessary
- Repeat session 1 steps 2-6

Step 2: Elicit motivation for additional changes

Discuss additional ideas and behaviours to support desired change. Recap some from session 1 that have not been addressed in detail yet.

Practice future person imagery exercise tailored to those specific scenarios, imagining downsides of not changing and then upsides of changing. Relate to progress they have already made

Step 3: Develop a plan for integrating additional change behaviours/goals

Explore what they would do to get started with additional change

Imagine taking those first steps again of working on your familiar goal for the day and imagine making the additional change- where it might fit?

How confident are you, on a scale of 0 to 100%, that you could do this for the next week?

Step 4: Strengthen self-efficacy for this new plan

Could any of the ideas you used in the past, even this past week, help additional change now?

Imagine working towards your familiar goal again over the next few days and how good it feels to succeed at each point.

Once more, incorporate (insert new change behaviour/goal) into the sequence as well, using your ideas/strategies to help you succeed.

Please take your time and really envision each step in that sequence as you let the day or week roll out in your imagination.

Check confidence

Step 5: Overcome barriers

Please roll out that newly edited personal movie once more, but this time watch out for anything that might have gotten harder, or in the way... and in your imagination find a solution. You will successfully work on your goals after all.

Discuss barriers and solutions.

Check confidence again

Introduce Cravings Buster© if appropriate

Step 6: Train imagery use outside of sessions

Review of session, reminders for home practise and appointment for boosters

Would you be able to practice what we've done over the next weeks?

Remember to really focus on the positive outcomes, in your imagery, and how you feel.

SUBSEQUENT BOOSTER SESSIONS

Protocol for 10-15 minute booster session

Step 1: Review

Elicit information about how things have been and how they are using imagery. Always affirm success.

What kind of situations are you using it in?

What have been the positive effects of making the changes you are working on so far?

What strategies did you use to achieve that?

If there are issues with using imagery, identify barriers to use of mental imagery and work through them

Step 2: Setting additional goals, testing in imagery and assessing confidence

Are there any additional activities you would like to add?

Try out in imagery

If no progress, or very transient progress, review original incentives, acknowledge issues, affirm partial change/reframe problems as learning experience

What you are telling me (partial changes) is already a big step in the right direction, well done. It might be helpful if we reflect on some of the things we covered in our sessions together

You were thinking about making a change because [summarise reasons for change] and you thought you might do this by [summarise planned strategies] and you knew you could do this because [summarise past successes]. Have any of these things changed?

If incentives have changed, work with this and take them through session 1 steps 2-5 again

If client is succeeding in behavioural plan but no longer seeing results, e.g., desired weight loss has stalled, guide through plateau exercise©

Step 3: Implementing revised action-plan and working through risky situations

Practice revised plan in imagery

While you are imagining your updated movie, are there any risky situations coming up that might be challenging for sticking to your goals? What could you do about that?

Advise participant to engage social support if they have not already done this

Step 4: Summarise session, affirm success, make next appointment, and encourage ongoing use of mental imagery

MAINTENACE BOOSTER SESSION 15-30 minutes

Step 1: Review

Elicit information about how things have been and how they are using imagery. Always affirm success, however partial, even at this stage.

Are you still using imagery? What has been the best part about using imagery so far?

What have been the positive effects of making the changes you are working on?

When will you be most likely to use imagery in the future?

Step 2: Maintaining changes

Discuss changes so far, reflect the positive emotions, to emphasize the difference these changes have made. Recap some of the challenges mentioned in session 1 and earlier boosters that have been successfully addressed. Ask how confident they are that they can keep these changes maintained.

Practice future person imagery exercise tailored to those specific scenarios, imagining downsides of not maintaining the positive changes and then upsides of staying on track. Relate to progress they have already made

Assess confidence again

Step 3: Setting new goals independently, using imagery and testing in imagery

Are there any additional activities you will be likely to add in the future? If so – will you be likely to use imagery to test if they fit with your routines and to help you overcome obstacles?

Remind them of the imagery audios, app and web support, to reinforce and refresh what they have learned in the sessions, especially when trying out additional goals.

Are there any additional activities you would like to add and practice now?

Try out in imagery

Practice revised plan in imagery

While you are imagining your updated movie, are there any risky situations coming up that might be challenging for sticking to your goals? What could you do about that?

Advise participant to engage with the website and app if they feel they are lapsing and to continue to engage social support. Help them with any technical difficulties in using the web-based resources.

Step 4: Summarise session, affirm success, encourage ongoing use of mental imagery to maintain motivation for change

Prompts for eliciting imagery

Prompts should encourage development of image without distracting client
Include plenty of silence

Avoid telling client what to include in their image

Initially, use detailed prompts to guide client through the different sensory aspects of their image

Imagine taking those first steps... how you get started...where you are...what you can see...and hear....and smell...who else is there

How you are feeling

Imagine you've been doing this for a week...how great it feels to be working successfully on your goal

Later, use more generic prompts to allow the client to develop their image freely

Make it as vivid as you can.../remember to use all your senses.../make it as real as possible

Notice how great it feels to succeed

When the client has a **complete plan**, encourage imagery as

your own private mini-movie,

or, a TV ad where you are the director explaining why you want to change, how you will do it, and how good it will feel to succeed

FIT script for periods of slow results: Plateau exercise[©]

It is normal for progress to be slower at some times than others. In the example below we address issues in weight loss, but this exercise can be re-scripted for other goals.

Weight loss, for example, slows after the initial weeks as the body adjusts to a new diet. This slowing can be discouraging and it is important to reassure the client that it is normal. Focus on the other rewards of the new patterns of behaviour that they are establishing – the client may not have lost any weight but perhaps they are feeling healthier or more energetic. If the client feels there is nothing more they can do towards their goal – they cannot reduce their calorie intake further or have no time to exercise more often – then it may be helpful to find other ways of strengthening their 'ideal self'. For example, if they wanted to lose weight so they could keep up with their children better, focus on other things they can do to work towards their ideal parent goal, for example planning an activity together or setting aside time to play a board game.

The reasoning is that closer the client gets to being their 'ideal self', the less they will want to engage in activities that contradict that self. Imagery brings them closer to that self in their mind, and by doing so makes that ideal a stronger motivator.

How have you been getting on?

I've been eating healthily and sticking to my exercise plan but I still weigh the same as a few weeks ago. It doesn't seem to be working any more.

You are frustrated that you aren't seeing the results at the moment but you are still exercising and eating well, which is great. It is normal for weight loss to slow down at this point because your body is adjusting to the changes you have made. Compared with [3 months ago], how do you feel in yourself?

[reflect back positives, like healthier or more energetic] Could even do an imagery exercise: *imagine how you were 3 months ago, then imagine how you feel now, notice the differences, notice how [things that are better].* Really focus on how good that feels.

If it is going well, stop at this point. If person still feels demotivated, continue with:

Would you like to try a new exercise to help keep you motivated while your body adjusts?

[if no, reassure that this one has nothing to do with diet or weight loss and see if they assent then]

You told me that you wanted to lose weight because [reasons]. Is that still the case?

[yes]

Let's have a think about other things you can do to work towards that goal.

Elicit ideas, then do imagery exercise. Bring to mind as vividly as possible...you are still eating healthily and exercising but you are doing this new behaviour too... first steps... how it feels while doing it...how you feel when you succeed.

How did that feel?

Reflect back positives, especially how close they are getting to their ideal self. Remember to reflect back that some of these benefits are from healthy eating and exercising, as well as from the new behaviour they are adding.

Cravings Buster[®]

If cravings are addressed at any stage as a barrier to goal pursuit take client through cravings buster exercise:

Due to limited working memory capacity, multi-sensory imagery will interfere directly with craving imagery, helping the client to combat the craving instantly.

The example below addresses food cravings for unhealthy snacks- but as the plateau exercise can be tailored to other cravings, compulsions and other obsessive behaviours.

'Please imagine one of the snacks you like and imagine holding it in your hand, looking at it right now- have you got an image?'

'Good, make it as vivid as you can, using all your senses...can you almost taste it?'

'Now please make a conscious effort to switch to your end goal imagery (e.g. to you wearing that beautiful dress at your daughter's wedding in a few months)...just for a few seconds indulge in that scenario, the finale of your own movie.'

'Have you got the image?'

'Great, sorry to bring you back now, but I have to ask: What happened to the chocolate... (bar/crisps)?'

Therapist Record Sheet (not to be given to client)

Client's key reasons for change 	Client's main challenges ('sustain' talk/imagery) 
Hypothetical goal 	Planned action 

Name/ID

Date

My goal



Motivational Thought Frequency scale^{4,5}

Today's Date: _____

Thinking about your goal, please select a number from 0 (not at all) to 10 (con
questions:

Over the last week how often did you

	0	1	2	3	4
... feel you wanted to do it?	Not at all <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
... feel you needed to do it?	Not at all <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
... have a strong urge to do it?	Not at all <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
... imagine how good it would be to do it?	Not at all <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...imagine how much better you'll feel if do it?	Not at all <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
... imagine how much worse you'll feel if you don't do	Not at all <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
... imagine yourself doing it?	Not at all <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
... imagine how you would do it?	Not at all <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...imagine succeeding at it?	Not at all <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
... picture times you did something like this in the	Not at all <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Over the last week, how often

... did thoughts about it come to mind?	Not at all <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
... did other things remind you about it?	Not at all <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
... did thoughts about it grab your attention?	Not at all <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Selected references from our group (*recommended papers to start your reading)

Descriptions of FIT

1. *May, J., Andrade, J., & Kavanagh, D. J. (2015). An imagery-based road map to develop a holistic strategy to tackle maladaptive motivation in clinical disorders. *Frontiers in Psychology (Affective Disorders and Psychosomatic Research)*, 6, 14. doi: 10.3389/fpsy.2015.00014
2. *Kavanagh, D. J., Andrade, J., May, J., & Connor, J. P. (2014). Motivational interventions may have greater sustained impact if they trained imagery-based self-management. *Addiction*, 109 (7), 1062-1063. doi: 10.1111/add.12507
3. Andrade, J., Khalil, M., Dickson, J., May, J., & Kavanagh, D. J. (2016). Functional Imagery Training to reduce snacking: Testing a novel intervention for weight management based on Elaborated Intrusion theory. *Appetite*, 100, 256-262. doi: 10.1016/j.appet.2016.02.015

Assessment instruments

4. Parham, S. C., Kavanagh, D. J., Gericke, C., King, N., May, J. & Andrade, J. (2016). Assessment of motivational cognitions in diabetic self-care: The Motivational Thought Frequency Scales for Glucose Testing, Physical Activity and Healthy Eating. *International Journal of Behavioural Medicine*. doi: 10.1007/s12529-016-9607-2
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Appendix G: FIT Practitioner's Handbook

The MTF scale provides a measure of the frequency of motivational cognitions over a week. It is based on Elaborated Intrusion theory, and assesses motivational strength (Q1-3), imagery related to incentives (Q4-6) and self-efficacy (Q7-10), and availability of goal-related thoughts (Q11-13).

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For further information, please see our website

<http://blogs.plymouth.ac.uk/functionalimagerytraining/>, which has more information and resources, including videos, Goal in Mind app and audio, research base and publications, and FIT manuals from trials.

Email contact: jackie.andrade@plymouth.ac.uk linda.solbrig@plymouth.ac

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