

## **PhD Project Brief - Functional Imagery Training as a personalized e-health intervention for weight loss**

### **1. Background to the study.**

Obesity is a rapidly increasing problem across the developed world. In England, over half the adult population is overweight with almost 25% of adults being classed as obese with a body mass index (BMI) of 30 or more (HSCIC, 2014). Obesity costs the NHS an estimated £3.2 billion (Allender & Rayner, 2007) and the UK economy £2.4 to £2.6 billion per annum in lost earnings (McCormick et al, 2007). Obesity rates are predicted to rise to over 50% by 2050 unless effective action is taken, with an estimated cost to the NHS of over £8 billion (NHS Information Centre, 2008).

Physical inactivity is estimated to cost a further £8.2 billion (Department of Health, 2004), particularly through the effects of and costs of treating chronic diseases such as heart disease and diabetes, the risks of which are increased by inactivity as well as by obesity. Physical activity among adults is increasing but only 66% of men and 56% of women meet the Chief Medical Officer's recommendations for physical activity (DoH, 2011; HSE report, 2012). Inactivity is related to body mass index, with higher levels of inactivity among overweight and obese adults compared with those who are not overweight (HSE report, 2008). Adding exercise increases the effectiveness of dieting (Miller et al, 1997) therefore it makes sense to tackle obesity and inactivity together.

Self-help treatments are ineffective, with typical initial weight loss followed by gain (Tsai & Wadden, 2005). On the other hand, brief motivational interventions are effective for a wide range of 'lifestyle' problems (MacCambridge & Rollnick, 2013). A recent systematic review concluded that motivational interviewing is effective for improving weight loss in overweight and obese participants (Armstrong et al, 2011) but there is a need for better techniques to sustain behaviour change over the longer term (Kavanagh, Andrade, May & Connor, 2014). We have developed a new psychological intervention called Functional Imagery Training (FIT) based on motivational interviewing that aims to develop important motivational skills aiding long-term change, derived from our cognitive theory of desire called Elaborated Intrusion theory (EI theory; Kavanagh, Andrade & May, 2005).

EI theory holds that vivid sensory imagery is key to intense desires ('cravings'), and subsequent research confirmed that multisensory imagery typically accompanies desires (including desires to eat or exercise), and that more vivid imagery is associated with stronger desire (May et al., 2008, 2014) While desires typically start with an intrusive thought, they can then hijack attention and place demands on limited-capacity systems in working memory. Noting that craving interferes with concurrent tasks that compete for attention, EI theory also predicted the converse: that concurrent cognitive tasks would reduce craving. Other visuospatial tasks (including competing imagery) were expected to have greatest impact, because they require the same working memory subsystems as the imagery that underpins craving. Later research has confirmed these predictions (Andrade et al., 2012). Converging evidence supports our prediction that imagery-based consideration of incentives to change will have greater affective impact than verbal discussion. Recent research shows that emotions are more closely tied to imagery, and imagery-based cognitive therapy is gaining strong support (Hackmann et al., 2011). Creating imagined

scenarios maintains a focus on the desired future rather than on temptations (Daniel, Stanton & Epstein, 2013). It makes plans more concrete, and increases the likelihood of carrying them out, by embedding plans in time and place, and eliciting realistic solutions to barriers. Imagery-based practice ('covert rehearsal') consolidates skills, and imagery of effective performance can guide actions and build self-efficacy (which helps to sustain effort). Given that competing imagery blunts cravings, imagery about the benefits of exercising is also expected to moderate the intensity of desires to eat.

FIT is a novel treatment that applies our theoretical and empirical advances on the nature of motivation and craving to the problem of weight management. FIT retains the interviewing style and spirit of motivational interviewing, but sessions focus on encouraging imaginal exploration, rather than verbal discussion. It is the first treatment to fully harness the power of motivational imagery to sustain behaviour change and resist temptation in the natural environment. It repeatedly rehearses imagery in sessions, cues everyday rehearsal by pairing with a routine behaviour (e.g., hand washing), and provides reminders to practise at high-risk times. Motivational interviewing has already been shown to be effective for weight management (Armstrong et al, 2011). FIT aims to increase the benefits of motivational interviewing by shifting the 'balance of power' in the competing mental images that support desire to eat and motivation to exercise (May et al, 2008), by impeding food craving imagery and encouraging positive imagery of exercising. FIT aims to improve long-term outcomes by training cognitive skills, specifically goal setting and goal imagery, so the client habitually visualises and desires healthy future outcomes over immediate temptations. We predict greater benefits of FIT over the long-term, compared with existing interventions, because clients are trained in cognitive skills – selecting, rehearsing, and updating motivational images – that will support healthier behavioural decisions. Long-term support is provided by a purpose-made app with which clients: 1) record and share their commitment, their main reason for change, and their plan for change with a supporter (engaging social support), 2) take and store photos to cue imagery about their actual achievements and effective coping strategies, about emerging benefits from their behaviour change, and about plans for new situational challenges they experience, 3) set visual reminders to engage in new behaviours and avoid risky situations.

## 2. Problem or issue to be investigated.

This project will test FIT in people who are overweight (BMI>25kg/m<sup>2</sup>) and therefore at risk of developing associated complications such as cardiovascular problems and type 2 diabetes. Many of the problems and potential costs of long term management of obesity could be reduced by a sustained weight loss of 5-10% of bodyweight. Technology has the potential to help people make changes to their lifestyle lose weight (Tate, 2001). However there is a need for personalized motivational support to sustain long-term behaviour change (Dick et al., 2011; Eastbrook et al., 2005; Nes et al., 2013).

We have been trialling FIT, supported by a smartphone app, for reducing alcohol misuse in Australia, with David Kavanagh at QUT. In line with the MRC guidance on complex interventions, this project will complete the feasibility and pilot stages of developing FIT as an intervention for obesity. We have already collected pilot data on two important elements of weight management, namely snacking on high calorie foods and sweetened drinks, and physical activity. Three pilot studies show that half an hour of FIT reduced snacking over two

weeks relative to advice alone, that it increased exercise frequency and duration in gym members compared with gym membership and monitoring alone, and that it increase physical activity relative to motivational interviewing. The first two phases of this project will test the feasibility of the intervention by testing the acceptability of the FIT for the target population and working closely with the sample to develop supporting materials and technology that are person-centred and specific to the problem of motivating better weight management. The third phase will be a pilot study to test the efficacy of FIT in an overweight sample, allow estimation of effect size, recruitment, drop out and compliance prior to bidding for funding for a full RCT.

### 3. Hypothesis, aims and objectives.

The aims of the study are:

1. To work with people who are overweight (have a BMI > 25kg/m<sup>2</sup>), to assess the acceptability of FIT in this population and to improve the design of the smartphone app, as well as exploring the need for additional web-based information and support. The supervisory team includes experience in collaborative app-development projects.
2. To test the hypothesis that FIT will be more effective than standard practice (brief advice and information) for achieving and sustaining improvements in diet and physical activity.

### 4. Proposed methodology.

**Phase 1:** 20 individuals with a BMI >25kg/m<sup>2</sup> will be recruited from the local University population and invited to focus groups to discuss their motivation for lifestyle change and what sort of motivational support they would find helpful. The aims of FIT will be introduced, and groups will discuss ways in which it does or does not meet their requirements.

**Phase 2:** based on patient input in phase 1, the smartphone FIT app will be improved and individuals will be invited to use it for 3 months, receiving follow up phone calls at 1 week, 3 weeks, and 7 weeks to assess progress and record information about diet and exercise. Interviews with individuals at baseline and 3 months will use timeline follow back methods to assess diet and exercise, and will ask participants how useable and useful they found the app. Improvements to the app will be based on their responses. [Note that smartphone ownership in the UK is anticipated to be 70% in 18-54 year-olds and 50% in those aged 55+, and rising rapidly, by the end of 2014; Deloitte report, 2014]

**Phase 3:** Pilot trial of effects of app-supported FIT for lifestyle change in people who are overweight (BMI.25kg/m<sup>2</sup>). An estimated 120 patients (depending on power analysis based on phase 2 results and interim power analysis from first 60 patients at 3 months) will be recruited from the local population and randomly assigned to a control group or FIT. The control group will receive the same advice as the FIT group but will not receive FIT. They will be invited to take part in a baseline session where they will be asked to complete questionnaires on well-being, motivation, self-efficacy, and complete a take-home diet and exercise diary for one week, as well as being weighed and measured. They will receive booster phone calls at 1 week, 2 weeks, 1 month and 2 months, to maintain interest in the trial, and return at 3 months and 6 months for data collection and return of second and

third diet and exercise diaries, which will have been mailed to them 2 weeks before the relevant lab appointment. Primary outcomes will be BMI and self-reported exercise and diet. Secondary outcomes will be electronically recorded usage of the app and/or website support and self-reported use of goal imagery, to test the prediction that imagery is central to behaviour change.

**Timeline:**

0-3 months: review of literature on brief motivational interventions in this population; application for ethical approval for phase 1

0-4 months: development of Android version of current iphone app

4-6 months: phase 1 – recruitment, focus groups

6-8 months: app development; recruitment to phase 2

8-13 months: phase 2 – uncontrolled pilot study of FIT supported by improved app

13-16 months: analysis and reporting of phase 2 results; ethical application for phase 3 trial

16-30 months: phase 3

31-36 months: phase 3 data analysis and writing up

5. Relevance/significance.

The research will test the benefits of a novel motivational intervention (FIT) to support lifestyle change in people who are overweight. If outcomes are supportive of FIT, the results will inform development of a multi-centre RCT testing the effectiveness of FIT on weight management long term in a more diverse population group. Such an RCT would include a health economic analysis of the cost-effectiveness of the intervention, and analysis of biochemical markers of diabetes risk.

**References**

Allender, S., & Rayner, M. (2007). The burden of overweight and obesity-related ill health in the UK. *Obesity reviews*, 8(5), 467-473.

Andrade, J., Pears, S., May, J. & Kavanagh, D. J. (2012). Use of a clay modeling task to reduce chocolate craving, *Appetite*, 58, 955–963

Armstrong, M. J., Mottershead, T. A., Ronksley, P. E., Sigal, R. J., Campbell, T. S., & Hemmelgarn, B. R. (2011). Motivational interviewing to improve weight loss in overweight and/or obese patients: a systematic review and meta-analysis of randomized controlled trials. *Obesity reviews*, 12(9), 709-723.

Daniel, T. O., Stanton, C. M., & Epstein, L. H. (2013). The Future Is Now Reducing Impulsivity and Energy Intake Using Episodic Future Thinking. *Psychological science*, 0956797613488780.

Deloitte (2014). The Deloitte Consumer Review: Digital Predictions 2014.

[http://www.deloitte.com/view/en\\_GB/uk/industries/consumer-business/consumer-review/the-smartphone-generation-gap/index.htm](http://www.deloitte.com/view/en_GB/uk/industries/consumer-business/consumer-review/the-smartphone-generation-gap/index.htm). Accessed 16/6/2014

Department of Health (2004) At least five a week; evidence on the impact of physical activity and its relationship to health. A report from the Chief Medical Officer. London: Department of Health.

Department of Health (2011). Start Active, Stay Active. A report on physical activity for health from the four home countries' Chief Medical Officers. DH, London.  
[www.bhfactive.org.uk/userfiles/Documents/startactivestayactive.pdf](http://www.bhfactive.org.uk/userfiles/Documents/startactivestayactive.pdf)

Hackmann, A., Bennett-Levy, J., & Holmes, E. A. (Eds.). (2011). *Oxford guide to imagery in cognitive therapy*. Oxford University Press.

Health and Social Care Information Centre (2014). Statistics on Obesity, Physical Activity and Diet: England 2014. <http://www.hscic.gov.uk/catalogue/PUB13648/Obes-phys-acti-diet-eng-2014-rep.pdf>, accessed 10/06/2014

Health Survey for England (2008). Health and Social Care Information Centre, 2009. <http://www.hscic.gov.uk/pubs/hse08physicalactivity>, accessed 10/06/2014

Health Survey for England (2012), early results. Health and Social Care Information Centre, 2013. [www.hscic.gov.uk/pubs/hse12early](http://www.hscic.gov.uk/pubs/hse12early), accessed 10/06/2014

Hex N, Bartlett C, Wright D et al. (in press). Estimating the current and future costs of Type 1 and Type 2 diabetes in the United Kingdom, including direct health costs and indirect societal and productivity costs. *Diabetic Medicine*

Kavanagh, D. J., Andrade, J. & May, J. (2005) Imaginary relish and exquisite torture: The Elaborated Intrusion theory of desire, *Psychological Review*, 112(2), 446-467.

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.

May, J., Andrade, J., Kavanagh, D. J., Feeney, G. F. X., Gullo, M., Statham, D. J., Skorka-Brown, J., Connolly, J. M., Cassimatis, M., Young, R. McD., & Connor, J. P. (in press, Dec 2013). The Craving Experience Questionnaire: A brief, theory-based measure of consummatory desire and craving. *Addiction*, 109, 728–735.

May, J., Andrade, J., Kavanagh, D., & Penfound, L. (2008). Imagery and strength of craving for eating, drinking and playing sport, *Cognition and Emotion*, 22(4), 633-650.

McCambridge, J., & Rollnick, S. (2013). Should brief interventions in primary care address alcohol problems more strongly?. *Addiction*.

McCormick, B., & Stone, I. (2007). Economic costs of obesity and the case for government intervention. *Obesity Reviews*, 8(s1), 161-164.

Tsai, A. G., & Wadden, T. A. (2005). Systematic review: an evaluation of major commercial weight loss programs in the United States. *Annals of internal medicine*, 142(1), 56-66.