Imagery and Implementation Intention: A Randomised Controlled Trial of Interventions to Increase Exercise Behaviour in the General Population

Multiple benefits of regular exercise are repeatedly cited in mass media and in the academic literature. In a recent publication by the British Department of Health (DH) published that recommended levels of exercise, at least 30 minutes of moderate-intensity physical activity five days a week, reduces the risk of cardiovascular disease, stroke, type II diabetes, colon cancer and breast cancer. Regular exercise may further benefit health through the positive effects on hypertension, body weight as well as mental and psychological health by reducing depression, anxiety and stress (Department of Health, 2004). In 2006 however, only 40 per cent of men and 28 per cent of women in the UK met the recommended levels of exercise (National Health Service Information Centre, 2008).

Habit, past behaviour, and implementation intentions

The notions of automised behaviour and behavioural patterns may explain one consistent predictor of exercise behaviour found in the literature, namely past behaviour. Bozeonelos and Bennett (1999) looked at the predictive power of theory of planned behaviour, other variables were added including past behaviour, personal norms (moral obligation, responsibility), role beliefs (what is perceived to be appropriate for the person’s status or situation), level of self-monitoring, and sex-role identity in relation to intention and behaviour. It was found that past behaviour was indeed the most predictive variable of exercise behaviour. Neither of the other variables significantly predicted exercise behaviour except exercise intention which was found to be a weak predictor of actual behaviour.

The intervention of implementation intentions has been proposed to motivate future behaviour through similar processes as past behaviour (Gollwitzer, 1993; Orbell, Hodgkins & Sheeran, 1997). There is considerable research evidence which suggest that implementation intention is a useful tool in changing behaviour. For example, Milne, Orbell, and Sheeran (2002) found that implementation intentions together with protection motivation theory had a significant effect on exercise behaviour. Implementation intentions simply ask participants to plan when and where they will exercise. For example, the thought "I intend to start exercising regularly" would result in the implementation intention of "I intend to go to the gym three times this week on my way home from work" and behaviour would be triggered by environmental cues such as 'walking passed the gym' or 'finishing work'. Both past behaviour and implementation intentions elicit associations in memory between certain behaviours and certain environmental cues. The distinction would be that past behaviour or habits are the unconscious process of pairing actual behaviour with environmental cues, potentially bypassing consciousness via automatisation, whereas implementation intentions is the conscious process of cognitively pairing intended behaviour with certain environmental cues. However, the two routes (unconscious and conscious) to behaviour are likely to co-occur.

Interestingly, laboratory studies show that participants who form implementation intentions have excellent memory for the timings and locations specified in their intentions, and that the behaviour is often performed exactly when and where specified (Gollwitzer, 1993). This may suggest that participants depend on certain environmental cues to maintain an exercise regime. This may in turn suggest that an intervention based on implementation intentions alone may be relatively strict and inflexible as individuals would rely on specific cues at specific times for the behaviour to occur as exactly demonstrated in the research. Considering automatic behaviours and the role of unconscious processes in behavioural patterns, implementation intentions may be of more inflexible nature as they dominantly occur on a conscious level.

For example, implementation intentions were found to be less effective in a study looking at repeated complex behaviours. According to Jackson et al. (2005) behaviours are complex when they ‘involve an elaborated process of specific decision-making’ (e.g. balanced diet or regular physical activity); this is compared to simple behaviours (e.g. taking a vitamin supplement). The authors looked at daily fruit and vegetable consumption over a period of three months in a sample of 120 cardiac patients. Consumption was not found to be improved by implementation intentions. The authors concluded that implementation intentions may work best with less complex behaviours and with student samples. Furthermore, complex behaviours may be less amenable to conscious decision processes and subsequently interventions which mainly target conscious processes may not be sufficient in changing behaviour. Considering the research suggesting the role of unconscious processes in behaviour change it may be useful to develop interventions which acknowledge unconscious processes. One intervention which may do this is guided imagery.

Guided imagery

Guided imagery has been widely researched in other fields including cardiology (Halpin, Speir, Capo Bianco & Barnett, 2002; Klaus, Beniaminovitz, Choi, Greenfield, Whitworth, Oz 2000), oncology (Kolcaba and Fox, 1999), stroke rehabilitation (Horrigan 2002) and pain management (Keefe, Abernethy and Campbell, 2005; Weydert, Shapiro, Acra, Monheim, Chambers and Ball, 2006). Guided imagery has been of interest within sport and exercise psychology, where it has been used to enhance physical performance, regulate arousal prior and during games, and to increase self-confidence (Jones and Stuth, 1997; Taktek, Zinsser and St

John, 2008). There is limited of research however investigating guided imagery as a health promotion intervention to motivate exercise behaviour change. Hall (1995) suggested a link between imagery use, cognitions and exercise behaviour change. That is, he suggested that certain imagery use may improve exercise cognitions such as self-confidence and outcome expectancy, which in turn may result in an increase in exercise motivation. Paivio (1985) had earlier proposed clear functions for imagery, in terms of both a cognitive role (language and performance enhancement) and a motivational role (controlling emotions or visualising goals and behaviours leading to these goals). Recently, Munroe-Chandler and Gammage (2005) developed a conceptual model suggesting how imagery use may be transferred from a sport setting to an exercise setting. They proposed three efficacy beliefs (efficacy expectancy, outcome expectancy, and outcome value) to mediate the relationship between functions of imagery and behavioural and cognitive outcomes.

The suggested relationship between imagery use and efficacy beliefs is consistent with previous work (e.g. Bandura, 1997 & Hall, 1995). Bandura's Social Cognitive Theory (SCT) posits that self-efficacy determines motivation prior exercise as well as persistence during exercise. He further argues that beliefs about personal efficacy influence the types of imagined features that individuals construct and that this relationship is bi-directional; that imagery in itself may be a source of self-efficacy. Indeed, imagining yourself performing a particular technique correctly may increase your confidence that you have the ability to perform the behaviour. There is substantial research evidence in the literature for a link between imagery use and efficacy. For example, Martin and Hall (1995) looked at imagery use, intrinsic motivation and performance on a golf-putting task and found that participants in the imagery groups spent more time practising, set higher and more realistic goals, and were more adherent to training programs outside the laboratory.

It has been proposed that imagery ability may confound the efficiency of any guided imagery or self-hypnosis intervention and that this may explain any conflicting findings. Indeed, imagery involvement is a well-studied correlate of hypnotic suggestibility and may also be helpful in identifying individuals with good imaging ability and thus aid in evaluating imagery interventions (Yapko (2003).

Aims of study

The current study had three central aims. Firstly, to investigate a potential role of pre-conscious processes in behaviour change. This was achieved by evaluating the effectiveness of two exercise interventions (guided imagery and manipulation of implementation intention) in their ability to increase exercise behaviour over a period of two weeks. The implementation intention intervention operates on a predominantly conscious, rational level, prompting behaviour through environmental cues specified in the implementation. The guided imagery intervention operates on a predominantly pre-conscious level and through the hypnotic techniques used the association between the cues and behaviour would be more deeply processed. In order to ensure that it was the motivational content of the imagery that was investigated, a relaxation imagery condition was included in the study. Relaxation imagery was not argued to motivate physical activity behaviour but was added to test possible effects of imagery content on behavioural and cognitive outcome.

The second aim of the study refers to the evidence suggesting a link between self-efficacy and exercise behaviour, and the suggested link between self-efficacy and imagery use (e.g.

Bandura, 1997 & Hall, 1995). The current study aimed to test whether an imagery intervention could increase self-efficacy and subsequently increase exercise behaviour.

Finally according to SCT self-efficacy (self perceived ability to successfully undertake exercise) would determine exercise motivation (orientation towards and desire to engage in exercise) prior actual physical activity. The study therefore included a third objective aiming to investigate whether imagery could not only increase self-efficacy, but also general motivation to exercise. These aims resulted in the hypotheses such that: participants in the guided imagery condition will increase their exercise levels and cognition scores (self-efficacy and motivation) significantly more than participants in other conditions, and that participants allocated to the implementations intention condition will increase their exercise behaviour and cognition scores (self-efficacy and motivation) significantly more than participants in the control and relaxation conditions but not more so than participants in the guided imagery condition.

Method

Design

The study was a randomised control trial with random allocation of participants to one of four conditions (guided imagery, implementation intention, relaxation, or control). Outcome variables (exercise behaviour, exercise self-efficacy and exercise motivation), were measured pre- and post intervention. Imagery ability was measured as a potential confounding variable of intervention efficiency. The study ran over a period of two weeks.

Participants

Fifty volunteers participated in the study (34 F, 16 M). Ages ranged from 19 to 56 years with a mean age of 29 years (SD 8.93). Forty-six (92%) participants were white European, two (4%) were Black-Caribbean, two (4%) were Asian. Twenty-nine (58%) were in full-time employment, 15 (30%) were in full-time education and 6 (12%) combined studying and work. Inclusion criteria included the ability to read and write English and not reporting to exercise regularly at baseline. The latter criterion was included to increase baseline comparability and the Godin LTEQ was used to identify eligible participants. Sample size was pre-determined by power analysis, and chosen to evaluate differences between the four conditions levels greater than 10%, achieving statistical power > 0.80 at < 0.05 probability level. Sample size required was 60 participants.

INSERT FIGURE ONE HERE.

Procedure

Recruitment: The study was advertised in three universities in the West of the UK. After initial contact, participants were sent a participant pack which included information about the study, a consent form and general advice about physical activity. At this point, participants could decide if they wanted to take part. To ensure a baseline of inactivity, participants were asked to report typical activity levels using the Leisure Time-Exercise Questionnaire (Godin and Shepard, 1997). No participants were excluded in this process. *Random allocation*: In order to ensure random allocation a set of 60 non-unique, unsorted numbers with a range from 1 to 4 (representing the research groups) was generated (an equal number of identification numbers were generated for each condition) and all participants were given an identification number (participant #1, participant #2 etc.). The set of numbers were generated using 'research randomizer' at http://www.randomizer.org. Participants were then assigned the condition number (1, 2, 3 or 4) that had been randomly assigned to their identification number. The researchers did not know which condition each participant had been allocated to as the preparation of participant packs were done by a colleague of the researchers. *Manipulation check:* A manipulation check was put in place to minimise risk of treatment fidelity which consisted of daily self-reports as to whether participants listened to the CDs or not. For the implementation intention group it was evident if the participants had completed the forms. Due to the design of the study, all the participants were guaranteed to receive identical treatment through the CDs thus intervention comparability was ensured. This controlled for possible effects of voice tone, body language which otherwise could have interfered with the reliability of outcomes. *Data collection:* When joining the study all participants were given the instruction 'to try to exercise during the following two weeks' and to monitor their exercise levels by completing provided exercise diaries. Further instructions stated they could engage in any exercise activity they wished and to return questionnaires and exercise diaries to the researcher using the prepaid envelope provided. On receipt of the completed questionnaires and exercise logs, the participants would via email receive a post-intervention questionnaire which was returned to the researcher via email. The imagery groups were also given a CD (either relaxation or guided imagery CD) which they were asked to listen to on a daily basis. The implementation intention group received in their exercise diaries weekly forms, where they were asked to write down when, where and what kind of exercise they planned to engage in. The control group only received instruction to try to exercise and to monitor their physical activity levels via the diaries.

Materials

Intervention Materials: The guided imagery (GI) script (790 words) and the relaxation script (778 words) were both about five minutes long and were created for the purpose of the study in collaboration with a qualified hypnotherapist and recorded in a studio. The content of the GI script included visualisations aiming to promote intrinsic motivation and encourage action (*make a determined fist with your strongest, most powerful hand…keep that fist and feel strong …)* and visualisations of future self to promote intrinsic motivation (*imagine yourself two weeks* *from now, having become more active…notice how good you feel, better you look, more confident and in control you are…).*

Measures

Exercise Self-Efficacy Scale (Bandura, 1997): self-efficacy was measured in accordance with Bandura's suggested method for assessing strength of self-efficacy in a specific domain i.e. exercise. The scale was an 18 item, 0-100% scale where 0 = 'I am certain I cannot perform exercise on a regular basis at all', 50% = 'moderately confident', 100% = 'certain I can'. (Alpha score for this sample was 0.85). *Motives for Physical Activities Measure – Revised (MPAM-R)* (Ryan, Frederick, Lepes, Rubio, Sheldon, 1997): exercise motivation was measured as a global score with five dimensions. The subscales were (a) Fitness, the wish to be physically healthy and to be strong and energetic (alpha score for this sample (0.45); (b) Appearance, the aim of becoming more physically attractive (alpha = 0.75); (c) Competence/Challenge, the wish to acquire a new skill or meet a challenge (alpha = 0.44); (d) Social, exercise to meet friends and/or meet new people (alpha = 0.52); and (e) Enjoyment, exercise is fun, makes you happy, and is interesting, stimulating, and enjoyable (alpha = 0.31). *Imagery Ability Questionnaire* (Kwekkeboom, 2000) this 32 item scale looked at participants' ability to absorb and generate images (alpha scores = 0.54). *Leisure Time-Exercise Questionnaire* (Godin and Shephard, 1997). This questionnaire was used to establish baseline exercise levels where participants were reported levels of strenuous and moderate physical activity episodes during a typical week. In addition, during the two weeks of the study, participants reported physical activity levels using diaries provided. Each day participants reported daily minutes of physical activity as well as type of activity (e.g. brisk walk, swimming). Moderate level of activity of at least 20 minutes counted as one exercise occasion.

Ethical Approval

This study was undertaken with the approval of the principal investigators' University's ethics committee and in accordance with the guidelines of the British Psychological Society.

Analysis

A one-way multiple analysis of covariance (MANCOVA) was carried out to test if the groups differed on post-intervention behaviour as well as exercise motivation and exercise self-efficacy. Thus, a linear relationship between outcome variables was assumed and pre-test scores were included as covariates. In addition, the analysis looked at the potential confounding effect of imagery ability on imagery intervention efficiency by including the variable as a covariate. A second MANCOVA tested between group differences on the subscales of the motivation scale.

Results

Baseline Comparability

The number of participants in each group at analysis was relaxation (n=10), implementation intention (n=13), control (n=14), and guided imagery (n=13). The groups did not differ significantly on physical activity baseline scores ($F(3, 47) = 2.026$, $p = 0.123$) but did however differ significantly on both self-efficacy and motivation baseline scores. This confirmed the importance of using baseline scores as covariates in subsequent analysis. The groups did not differ significantly on imagery ability ($F(3, 47) = 1.503$, $p = 0.226$), age ($F(3,47) = 2.574$, $p = 0.065$), employment ($F(3,47) = 0.668$, p, 0.576), or ethnic origin ($F(3,47) = 0.783$, $p = 0.509$).

Post-intervention analysis

Please refer to Table 1 for demographic data, pre- and post mean scores of behaviour and exercise cognition scores. Guided imagery (GI) group had the highest exercise levels post-intervention followed by implementation intention group, relaxation group, and lastly controls. Prior to the study, participants exercised on average 2.62 (SD 1.90) times per week (strenuous and moderate exercise). Thirty-five (76%) participants did not meet recommended activity levels of accumulated 30 minutes 5 times a week (Department of Health 2004). After the study however, this figure was six (13%), with the majority 4 (67%) being in the control group. Three participants decreased their exercise levels, two allocated to the implementation intention group and one to controls.

INSERT TABLE ONE HERE.

A one-way MANCOVA using pre-scores as covariates suggested that there was a multivariate difference between the intervention groups ($F(9, 100) = 2.04$, $p = 0.043$, Wilks' lambda = 0.664) with a partial eta squared of 0.128 suggesting that 13% of the variation in the linear combination of the dependent variables was accounted for by group allocation. Univariate tests confirmed that significant differences existed between the exercise behaviour and group allocation ($F(3, 43) = 3.722$, $p = 0.018$). Further post-hoc test (Tukey HSD) confirmed a significant difference between implementation intention group and controls ($p = 0.048$; effect size (d) = 0.92) and between GI group and controls ($p = 0.012$; effect size (d) = 1.46). There were no significant differences between the other groups: relaxation - control, relaxation – GI, and GI – implementation intention. The effect of guided imagery on post-intervention exercise scores was still statistically significant even when imagery ability was controlled for (F) (3, 42) = 30.168, $p = 0.45$) with a partial eta squared of (0.172).

Looking at the subscales of the motivation scores (enjoyment, fitness, competence/ challenge, appearance and social) a one-way MANCOVA using pre-scores as covariates showed no multivariate difference between the groups ($F(15,103) = 1.291$, $p = 0.222$, partial eta squared

= 0.147) on the subscales. However, implementation intention had the most consistent trend of decreased scores. In contrast to the control group, implementation intention group did not increase their enjoyment, appearance or social scores. Guided imagery was the only group to increase their motivation due to fitness goals. The control group reported largest increase on motivation appearance scores.

INSERT FIGURE TWO HERE.

Discussion

This study aimed to investigate the role of unconscious processes in exercise behaviour change by comparing the efficiency of two exercise interventions (guided imagery and implementation intention). It was predicted that the guided imagery intervention would be more effective in motivating participants to exercise as well as increasing self-efficacy and actual exercise behaviour. This was based on the proposition that guided imagery would operate on a predominantly pre-conscious level. The addition of a relaxation imagery condition allowed the study to further investigate whether indeed the suggestions and techniques in the guided imagery script promoted behaviour change. The results show that, in accordance with predictions, participants in the guided imagery group increased their exercise levels the most, not significantly more so than implementation intention group however. Both intervention groups (guided imagery and implementation intention) were successful; both increasing exercise levels significantly more so than the control group. None of the groups differed significantly on exercise cognitions (self-efficacy and motivation).

Behavioural outcome

Support for implementation intention as an effective exercise intervention has been consistently found in previous research (e.g. Gollwitzer, 1993). The current findings add support to this evidence, but challenge the proposition that implementation intention manipulation is less useful with complex behaviours and non-student samples (Jackson et al., 2005). The majority of the participants in this study were in full time employment and the study addressed exercise, a complex behaviour.

Further, the current study shows that a short guided imagery intervention may be successful in increasing exercise behaviour. This is consistent with previous research linking imagery with sport performance (e.g. Short et al., 2005). These findings further suggest that imagery may be used not only in a sport context but in a health promotion context as well. Future research should be directed towards an understanding of how different functions of imagery may result in different behavioural outcomes. Different individuals may be inactive for different reasons and thus be more responsive to certain suggestions than others. For example, one individual may benefit from mentally increasing their confidence in a particular skill (or just to go to the gym at all which may be intimidating) (Cognitive Specific) yet another person may benefit more from focusing on a future thinner self (Motivation Specific function). Thus, it may be of great use to investigate how the different functions of imagery serve different exercise outcomes as observed with sport performance (e.g. Short et al., 2005).

Evaluation of the interventions

Looking at actual exercise occasions for each group, the control group exercised almost half the number of times as each intervention group (five times over two weeks). The difference between the guided imagery and implementation intention groups however was not that large (9.4 and 8.7 times respectively). Interestingly, looking at the strategies used in the interventions to increase behaviour there are similarities. Each may encourage the participant to imagine a future self in an exercise context. Although implementation intentions do not explicitly state ‘imagine yourself…’ but rather instruct the participant to plan their future behaviour, an image or idea of a future self may often occur. Indeed, it is almost impossible to plan a future event without producing a corresponding image. That is, there may be some overlap in how guided imagery and implementation intentions work. A closer look at the motivation subscales may however suggest a qualitative difference as to why behaviour occurred in the different intervention groups.

Even though the groups did not differ significantly on motivation subscale scores there is an observable tendency to differ between the groups. Firstly, implementation intention was the only group to decrease their global scores. Participants became less motivated to exercise in regards to joy to exercise, exercise to look good, to get fit and social networking. On the contrary, except for social networking, guided imagery group increased all their sub scores. One explanation of this difference may be the nature in which behaviour occurred in the implementation intention group. Participants were asked to write down planned exercise events which later may have felt forced or obligatory and thus less enjoyable (intrinsic motivation). That is, although the behaviour was acted out participants may not have enjoyed it or felt other sources of motivation other than that of the commitment to the implementation. Thus, the two interventions may have resulted in similar behavioural outcomes but not necessarily for the same reasons. Indeed, a longitudinal study may show that while the short-term outcomes between implementation intention and guided imagery interventions were comparable, guided imagery may demonstrate long-term gains and maintenance of exercise due to the presumably more intrinsic nature of the procedure as evidenced by the motivational subscales. In essence, the guided imagery procedure involves the active construction of a healthy possible self prior to exercise, whereas implementation intervention relies on its construction during or post-exercise.

In that way, guided imagery may offer a more direct interventional route by encoding the necessary identity and motor-behaviours prior to actual exercise. Such reasoning justifies the use of guided imagery in sport is likewise important to health behaviour.

Indeed, hypnotic or guided imagery interventions may derive their utility by constructing a possible self-schema in a particular domain. There is some evidence that hypothesised possible selves may motivate current behaviour. Hooker and Kaus (1994) found that having a possible self in the realm of health was more strongly related to health behaviours than was a global measure of health values. Possible selves are images of the self in the future and include hoped for, feared, as well as positive and negative possible selves. Thus, it puts the development of the self in a lifespan perspective and includes organisational (schemas) and emotional (affect-value) elements. If one has a possible self in a particular domain, not only will relevant information be processed faster, but it will also be appraised as self-enhancing or self-threatening because it is perceived to be important for the self. This may be due to information that is perceived to be relevant to the self being more easily encoded and retrieved from memory. Thus, in the context of health promotion, if an individual has a possible health self, health related information will be perceived as important or relevant and likewise health related cues will be more likely to activate or initiate behaviour. In fact, it has been found that the activation of specific future self-images rather than general persuasive messages is more useful in influencing subsequent behaviour (Ruvolo and Markus, 1992).

It is important to highlight that the relaxation group followed similar physical activity trend (7,8 times over two weeks) as guided imagery and implementation intention groups (9.4 and 8.7 times respectively). Thus, daily relaxation exercises resulted in similar increase in physical activity as guided imagery and the implementation intention intervention. There may be several reasons for these results. Regular relaxation may have enabled participants to be successful in their behaviour change. Alternatively, a larger sample may identify a difference between the three different groups.

Self-efficacy and motivation

Consistent with previous research, neither of the interventions significantly increased self-efficacy or motivation. For example, Martin and Hall (1995) looked at intrinsic motivation and guided imagery in relation to a golf-putting task. They found that participants in the imagery group adhered more to the training programme but that they did not develop significantly higher self-efficacy levels than the control group. The authors explain their findings with Social Cognitive Theory (SCT) (Bandura, 1997) and the temporal lag of self-efficacy. Bandura (1997) suggested that due to the potential temporal lag of self-efficacy, short-term studies may not give sufficient time in order for measurable self-efficacy to develop.

Alternatively, the exercise script used in this study may not have sufficiently included self-efficacy related images, and subsequently, exercise self-efficacy may not have been generated. Munroe-Chandler and Gammage (2005) propose that different functions of imagery result in different cognitive and behavioural outcomes. The exercise script was not generated with the aim of increasing self-efficacy but rather to increase exercise behaviour per se. Increased self-efficacy was assumed to automatically follow, which may have been unfounded. This would however suggest that high self-efficacy is not necessarily in order for a behaviour change to occur.

Similar to exercise self-efficacy, the groups did not differ on exercise motivation scores post-intervention. Looking at implementation intention intervention, this is consistent with previous findings. It has been found that implementation itself may increase actual behaviour but not behavioural intentions. Milne, Orbell and Sheeran (2002) found that an information leaflet about the benefits of exercising increased motivation and intention to exercise but not actual exercise behaviour. An implementation intention intervention however significantly increased exercise behaviour but did not alter motivation. These findings supports Gollwitzer's (1993) claim that implementations are volitional and distinct from intention, which is motivational.

Limitations of the study

It is important to highlight potential limitations of the study. Firstly, a possible limitation is the way that exercise outcome was measured using a subjective measure and therefore vulnerable to social desirability bias. An objective record (e.g. pedometers) could have been used however; as the study was primarily concerned with the frequency of exercise episodes and the decision to exercise, diaries would have been used regardless. Second, the study only included a two week follow up. Considering the challenges of long-term behaviour change and the possible gains of guided imagery, longitudinal studies are needed comparing exercise interventions long-term. Further, when looking at changes in cognitions such as self-efficacy and motivation, two weeks may not be sufficient time for these to be established. Third, it may have been useful to check for outcome expectancy as well as previous experience of guided imagery or hypnosis. High expectations and general positive attitude toward the intervention may make the person more susceptible to the intervention. From an applied point of view a client's expectations of a guided imagery session may not necessarily interfere with therapy outcome but rather the opposite, expectation levels may be used as a tool within the session. From a research point of view however, it may be important to control for this variable in order to more accurately establish intervention efficiency. If the relationship between intervention expectations and outcome is stronger in one particular sample, it may result in inflated intervention efficiency.

Fourth, the low alpha scores for the motivation subscales within this sample may be a limitation of the study and thus in future work, alternative measurement should be at least considered. Lastly, the study did not include a manipulation check such as measures of imagery use to control for equivalence of imagery use across the groups. In future studies, a measure of mental imagery use should be included as a manipulation check.

Implications for behaviour change theory

The current study adds to our understanding of antecedents of behaviour change in general, particularly from a social cognition perspective. Social cognition models are used to predict and understand health behaviours and behaviour change. In general, the variance explained by these models is around 30% (Nigg, Allegrante, Ory, 2002). For example, in a meta-analysis of 87 Theory of Planned Behaviour studies, Godin and Kok (1996) showed that TPB accounted for 41% of the variance for behavioural intentions and 34% of the variance for a range of health behaviours. In a similar meta-analysis, Armitage and Conner (2001) concluded that Theory of Planned Behaviour only explained 27% of the variance of behavioural intentions, and 39% of self-reported behaviour. The underpinning assumption of these models is Subjective Expected Utility (SEU) theory (Edwards, 1954). This theory suggests that behaviour is a result of rational weighting of costs and benefits. That is, behaviour is supposed to arise principally as a result of rational processing. Subsequently, exercise interventions inspired by social cognition models or SEU theory assume behaviour change to occur on a mainly rational level. The success of the guided imagery intervention in the current study to promote behaviour change suggests that irrational, or at least non-rational pre-conscious processes may play an important role in behaviour change.

The success of both the rational, conscious (implementation intention) and non-rational pre-conscious (guided imagery) interventions in comparison to the control conditions is consistent with Cognitive-Experiential Self Theory (CEST) (Pacini and Epstein, 1999). This models the role of information processing with two independent, interactive systems: experiential and rational. The experiential system is argued to be automatic, preconscious, rapid, primarily imagistic, concrete, associative, and closely related with affect. The rational system on the other hand is primarily conscious, primarily verbal, analytical, affect free, and it derives its schemas from logical inference. This system processes abstract information effortlessly and long-term consequences may be easily considered but not necessarily acted upon. Contrary to the assumption of social cognition models CEST proposes that behaviour is a result of the collaboration of both systems which may indeed be demonstrated by the ratio-bias phenomenon as seen (Pacini and Epstein, 1999). With this in consideration, when designing behaviour change interventions, unconscious processes should be acknowledged.

Implications for practice

The study suggests that a short guided imagery intervention may be effective in increasing exercise behaviour. Considering the large amount of research evidence suggesting the positive effects of guided imagery within sport contexts it may now be timely to make use of this knowledge in exercise or health promotion contexts. Everyday imagery use is inevitable and a guided imagery intervention just simply guides the individual to use the imagery which encourages them to reach their highest potential.

Imagery ability may influence the utility of a guided imagery intervention however. It has been proposed that imagery ability may confound the efficiency of any guided imagery or self-hypnosis intervention and that this may explain any conflicting findings (Kwekkeboom, 2001).

Further research is needed however to explore the potential impact of imagery ability on guided imagery type interventions and behaviour change. In addition, research exploring how to incorporate additional sensory modalities (auditory, tactile or olfactory) within guided imagery interventions may be useful in making interventions more effective.

A guided imagery intervention could otherwise be relatively flexible as different sessions or scripts could be developed for different target populations. Due to the different functions of imagery, interventions could even be tailored individually: for example, a source of motivation for young women may be around changes in their appearance, whereas an older target group may be motivated by a healthy heart or general fitness. Again, research looking at different functions of imagery may aid in making imagery interventions more efficient and more able to tap into the different needs of different groups.

Conclusions

This randomised controlled study of guided imagery and implementation intention exercise interventions against relaxation controls, and no intervention controls demonstrated the success of both in increasing exercise behaviour. These are self-managed, economic and practical interventions which may be further developed for particular populations or behaviours. Furthermore, it is possible to see these results as a challenge for the subjective expected utility basis of social cognition models of health behaviour, as it highlights the importance of considering both conscious and pre-conscious processes antecedents to behaviour change.

References

Armitage, C. J., & Conner, M., (2001). Efficacy of the theory of planned behaviour: A meta analytic review. *British Journal of Social Psychology, 40(4)*, 471.

Bandura, A., (1997). *Self-Efficacy: The Exercise of Control.* New York: W.H. Freeman and Company.

Bozionelos, G. & Bennett, P., (1999). The Theory of Planned Behaviour as Predictor of Exercise: The Moderating Influence of Beliefs and Personality Variables. *Journal of Health Psychology, 4*(4), 517-529.

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 Office.*

Edwards, W. (1954). The theory of decision making. *Psychological Bulletin,* 51 (4), 380-417.

Godin, G., & Kok, G., (1996). The theory of planned behaviour: A review of its applications to health related behaviours. *American Journal of Health Promotion, 11(2),* 87-98.

Godin, G., &Shephard, R. J. (1997). Leisure-Time Exercise Questionnaire. A Collection of Physical Activity Questionnaires for Health-Related. *Research Medicine & Science in Sports & Exercise, 29*(6) Supplement: 36-38.

Gollwitzer, P. M. (1993). Goal achievement: The role of intentions. *European Review of Social Psychology, 4(1),* 141-185.

Hall, C. R. (1995). *The motivational function of mental imagery for participation in sport and exercise.* The British Psychological Society: Leicester.

Halpin, L. S., Speir, A. M., CapoBianco, P., & Barnett, S. D. (2002). Guided imagery in cardiac surgery. *Outcomes Management, 6*(3), 132-137.

Hooker, K., & Kaus, C. R. (1994). Health-related possible selves in young and middle adulthood. *Psychology and Aging, 9*(1), 126-133.

Horrigan, B. (2002). Imagery: The body's natural language for healing. *Alternative Therapies in Health and Medicine, 8*(1), 80-89.

Jackson, C., Lawton, R., Knapp, P., Raynor, D. K., Conner, M., Lowe, C., & Closs, S. J. (2005). Beyond intention: do specific plans increase health behaviours in patients in primary care? A study of fruit and vegetable consumption. *Social Science & Medicine, 60*(10), 2383-2391.

Jones, L., & Stuth, G. (1997). The uses of mental imagery in athletics: An overview. *Applied and Preventative Psychology,* 6(2), 101-115.

Keefe, F. J., Abernethy, A. P., & Campbell, L. C., (2005). Psychological approaches to understanding and treating disease-related pain. *Annual Review of Psychology, 56,* 601-630.

Klaus, L., Beniaminovitz, A., Choi, L., Greenfield, F., Whitworth, G., & Oz, M. (2000). Pilot study of guided imagery use in patients with severe heart failure. *American Journal of Cardiology, 86(1),* 101-104.

Kolcaba, K., & Fox, C. (1999). The effects of guided imagery on comfort of women with early stage breast cancer undergoing radiation therapy. *Oncology Nursing Forum, 26*(1), 67-72.

Kwekkeboom, K., L. (2000). Measuring imaging ability: Psychometric testing of the Imaging Ability Questionnaire. *Research in Nursing and Health, 23(4),* 301-309.

Martin, K. A., & Hall, C. R. (1995). Using mental imagery to enhance intrinsic motivation. *Journal of Sport and Exercise Psychology, 17(1),* 54-69.

Milne, S., Orbell, S., & Sheeran, P. (2002). Combining motivational and volitional interventions to promote exercise participation: Protection motivation theory and implementation intentions. *British Journal of Health Psychology, 7(2),* 163-184.

Munroe-Chandler, K. J., & Gammage, K. L., (2005). Now see this: A new version of exercise imagery. *Exercise Sport Sciences Review, 33*(4), 201-205

National Health Service Information Centre (2008). *Health Survey for England 2006: CVD and risk factors adults, obesity and risk factors children.*

Nigg, C. R., Allegrante, J. P., & Ory, M. (2002). Theory-comparison and multiple-behaviour research: common themes advancing health behaviour research. *Health Education Research, Theory and Practice, 17*(5), 670-679.

Orbell, S., Hodgkins, S., & Sheeran, P. (1997). Implementation intentions and the theory of planned behaviour. *Personality and Social Psychology Bulletin, 23(9),* 945-554.

Pacini, R., & Epstein, S. (1999). The relation of rational and experiential information-processing styles to personality, basic beliefs and the ratio bias phenomenon. *Journal of Personality and Social Psychology, 76(6),* 972-987.

Paivio, A. (1969). Mental imagery in associative learning and memory. *Psychological Review, 76*(3), 241-263.

Paivio, A. (1985). Cognitive and motivational functions of imagery in human performance. *Canadian Journal of Applied Sport Sciences, 10(4),* 225-285.

Research Randomizer (n. d.) Retrieved from www.randomizer.org. November 2009.

Ruvolo, A. P., & Markus, H. R. (1992). Possible selves and performance: the power of self-relevant imagery. *Social Cognition, 10(1),* 95-124.

Ryan, R. M., Frederick, C. M., Lepes, D., Rubio, N., & Sheldon, K. M. (1997). Intrinsic motivation and exercise adherence. *International Journal of Sport Psychology, 28(4),* 335-354.

Short, S. E., Tenute, A., & Feltz, D. L. (2005). Imagery use in sport: Mediational effects for efficacy. *Journal of Sports Sciences, 23(9),* 951-960.

Taktek, K., Zinsser, N., St John, B., (2008). Visual versus kinesthetic mental imagery: efficacy for the retention and transfer of a closed motor skill in young children. *Canadian Journal of Experiemental Psychology, 62(3),* 174-187.

Weydert, J., A., Shapiro, D., E., Acra, S., A., Monheim, C., J., Chambers, A., S., Ball, T., M., (2006). Evaluation of guided imagery as treatment for recurrent abdominal pain in children: A randomized control trial. *BMC Paediatrics, 6 article number 29*.

Yapko, M., D., (2003). Trancework. 3rd Edition, An Introduction to the Practice of Clinical Hypnosis. Brunner-Routledge: Hove