The Efficacy of Positive Psychology Interventions to Increase Well-
Being and the Role of Mental Imagery Ability

Natasha Odou and Dianne A Vella-Brodrick

School of Psychology and Psychiatry, Monash University, Victoria, Australia.

Corresponding author:

Dianne Vella-Brodrick

Dianne.Vella-Brodrick@monash.edu

Ph: +61 3 9903 2542

Fax: +61 3 9905 3948

Abstract

This study examined the effects of mental imagery ability (MIA) on the efficacy of two positive psychology interventions (PPIs) to enhance well-being. Participants ($N = 210$) were randomly assigned to either: Three Good Things (TGT), Best Possible Selves (BPS), or a control group and completed well-being questionnaires pre and post intervention. ANCOVA results partially supported the hypothesis that the interventions would significantly increase well-being (measured by the WEMWBS, PA and NA) compared to the control group. Correlations partially supported the prediction that greater effort and motivation towards the PPI would relate to greater increases in well-being. MIA was not found to influence the efficacy of the PPIs, hence, refuting the final hypothesis that participants with high MIA would report greater post-intervention increases in well-being than participants with low MIA (measured by imagery vividness and controllability scales). Well-being was positively correlated with MIA suggesting that improving MIA might facilitate an increase in well-being regardless of PPI use.

Background

The pursuit of happiness and well-being is, for many, one of life's primary aspirations (Eid & Larsen, 2008). In the past decade, positive psychology scholars have found a vast array of beneficial correlates and outcomes of mentally healthy individuals, including being more creative, energetic, resilient, and socially engaged, compared to their unhappy counterparts (e.g. Lyubomirsky, King, & Diener, 2005). As a primary life aspiration that has individual and community benefits, it is therefore important to examine how well-being can be increased.

Two definitions of well-being are prominent in the social science literature: subjective well-being, comprising affective and cognitive components, (Diener & Lucas, 1999), or psychological well-being, which refers to the degree an individual has meaning and purpose in life (Ryff & Keyes, 1995). Both theoretical and empirical evidence highlights the existence of a significant overlap in the true meaning and nature of these definitions (Kashdan, Biswas-Diener, & King, 2008; Linley, Maltby, Wood, Osborne, & Hurling, 2009). Consequently, a more holistic and integrated approach to studying well-being is necessary and more contemporary approaches and measures, such as the Warwick-Edinburgh Mental Well-Being Scale (WEMWBS; Tennant, et al., 2007), are reflecting this more comprehensive framework.

Beyond understanding what constitutes well-being is the question about whether or not well-being can be increased, and sustainably increased. The Architecture of Sustainable Change proposes that well-being can be increased through engaging in volitional activities (Lyubomirsky, Sheldon, & Schkade, 2005). This model is based on research showing that approximately 50% of the variance of well-being is genetically determined (Lykken & Tellegen, 1996) and an extra 10% of the

variance can be attributed to circumstantial factors, such as marital status and income (Diener, Lucas, & Scollon, 2006). As genes are largely unchangeable, and circumstantial factors are susceptible to hedonic adaptation (Diener, et al., 2006), the remaining 40% of the variance in well-being is the most promising for increasing and sustaining higher well-being levels. This remaining variance is attributed to volitional (or intentional) activities (Lyubomirsky, et al.). The development of a range of positive psychology interventions (PPIs), designed to increase positive feelings, behaviours and cognitions, are structured forms of volitional activities that can be used by the general population (Sin & Lyubomirsky, 2009). Two empirically supported PPIs are Three Good Things (TGT) and Best Possible Selves (BPS).

The TGT intervention involves thinking about and writing down three good things that happened in one's day and their causes. TGT and other gratitude interventions are activities that increase well-being through fostering a focus on what one has in life rather than on what one is lacking (Emmons & McCullough, 2003). In this way, these activities counteract hedonic adaptation to experiences otherwise taken for granted. Furthermore, feelings of gratitude are incompatible with negative emotions, and thus may reduce feelings such as envy and greed (McCullough, Emmons, & Tsang, 2002). Gratitude interventions also initiate *savouring*, in which enjoyment of a pleasurable experience is prolonged (Bryant, 2003), thus augmenting the benefit of positive experiences in life.

Seligman, Steen, Park and Peterson (2005) demonstrated the potential for the TGT intervention to increase well-being for six months. Participants (N = 411) completed happiness and depression measures before, after and at one, three and six-month follow-ups, after completing one of five PPIs or a placebo control activity for one week. At the six-month follow-up the TGT intervention group reported

significantly higher happiness scores, (effect size, $\lambda^2 = .50$) and significantly lower depression scores (effect size, $\lambda^2 = .28$) than the controls. These long-term benefits were most pronounced for people who adhered to the exercise during the first week and who also continued thereafter.

The BPS intervention involves imagining and writing about the realisation of one's dreams and the fulfilment of life goals, that is, one's best possible future self (Sheldon & Lyubomirsky, 2006). This intervention is expected to increase well-being through bringing awareness and clarity to life goals and values, and enabling the clarification and reorganisation of priorities (King, 2001). The BPS intervention also provides the opportunity for self-reflection and insight into motives and emotions (Sheldon & Lyubomirsky). Having clear and valued goals, and greater self-awareness are related to positive affect (PA) and healthy psychological functioning (Emmons, 1986; Hassed, 2008).

The BPS PPI was first evaluated by King (2001), in a study of 81 students who were randomly assigned to either write about their best possible self or not. Findings showed that BPS significantly increased mood (measured by net positive mood, PA-NA) and psychological well-being, compared to the control group. However, this study is limited by using negative affect (NA) to compute overall mood, as the results do not indicate whether the intervention was more effective in increasing PA or decreasing NA, as the two are not synonymous (Schimmack, 2008).

Further support for BPS comes from Sheldon and Lyubomirsky (2006) who examined visualising BPS and Expressing Gratitude over four weeks compared to a placebo control. The study found that BPS was the more effective intervention. Participants in the BPS condition increased in PA (as measured by the PANAS) compared to the control group across four weeks. No significant main effects were

observed for NA. Continued BPS performance across four weeks led to higher increases in PA compared to Expressing Gratitude or the placebo control exercise, suggesting it is a more effective PPI. Similarly, Peters, Flink, Boersma, and Linton (2010) found that students undertaking the BPS intervention once ($n = 44$), increased in PA and positive expectancies significantly more than writing about a typical day once ($n = 38$).

Sin and Lyubomirsky (2009) conducted a meta-analysis of 51 interventions ($N = 4,266$) and concluded that PPIs can significantly increase well-being (mean effect size $r = .29$) and decrease depressive symptoms (mean effect size $r = .32$). While PPIs in general and TGT and BPS in particular, are validated interventions that can effectively increase well-being, they do not work uniformly for all individuals, nor do they consistently provide the average effect sizes. It is therefore necessary to examine how to increase the consistency with which PPIs are effective and the applicability of specific interventions for individuals with particular characteristics.

Two factors influencing the efficacy of PPIs are effort and motivation. To increase and sustain well-being, empirical evidence suggests that volitional activities require sufficient investment of effort and commitment to *initiate* the activity, but also to *carry out* and *maintain* the activity (Sheldon, et al., 2010). Past research has measured effort by assessing the number of times an individual engages with an activity (e.g. Sheldon & Lyubomirsky, 2006), however, the amount of time spent on each trial of an activity, can also indicate effort and may relate to the efficacy of the PPI. Due to individual differences, a particular intervention will not be effective for every person. Thus *person-activity fit* factors (i.e., the interaction of individual differences and intentional activities) need to be considered if the efficacy of PPIs is to be improved (Lyubomirsky, Sheldon, et al., 2005). Empirical evidence shows that

self-concordant motivation, that is, when an activity is valued by and is interesting for the individual, leads to greater improvements in well-being (Sheldon & Houser-Marko, 2001). In essence, the more motivated participants are to do a PPI the more likely well-being will be sustainably increased.

Mental imagery ability (MIA) is a person-activity fit factor that may significantly increase the efficacy of some PPIs as they appear to rely on imagery in recalling past experiences (e.g. TGT) and imagining future events (e.g. BPS). MIA is the ability to be engaged with and immersed in mental images as if they were real (Kwekkeboom, Huseby-Moore, & Ward, 1998) through a high degree of vividness and controllability of images (Murphy & Jowdy, 1992). Mental imagery has been used effectively with many problems and abilities including, pain reduction (Kwekkeboom, et al., 1998), and performance enhancement (Martin, Moritz, & Hall, 1999). Research is beginning to explore the effect of mental imagery on increasing well-being. For example participants in a study by Peters, et al. (2010) did five minutes of mental imagery focusing on their BPS after writing about it for 15 minutes. While this study found significant increases in well-being compared to a control group, mental imagery ability was not measured. Thus research is needed to explore the relationship between MIA and the efficacy of PPIs to increase well-being. Three reasons, based on theoretical and empirical evidence, provide a strong rationale to support MIA as an influential person-activity fit factor.

Firstly there is a strong association between mental imagery and emotion, such that mental images can activate emotions in the same way life experiences evoke emotions (Carver & Scheier, 2001; Holmes & Mathews, 2010). This occurs, as imagery of a stimulus can stimulate the same parts of the brain that are activated by the actual stimuli (Kosslyn & Thompson, 2003). This appears to be mediated by

imagery ability as people with higher MIA elicited a stronger emotional response than people with poor MIA (Miller, et al., 1987). Secondly, MIA may illuminate feelings of autonomy, competence and relatedness, three core psychological needs positively related to well-being (Deci & Ryan, 2000; Ryan, 1995). A good thing, as in the TGT PPI, can be defined as an event in which these psychological needs are met (Sheldon, Ryan, & Reis, 1996). Consequently then, in the same way that imagery amplifies emotion, using imagery in recalling these events would likely evoke a sense of need satisfaction in the present moment, facilitating optimal functioning and well-being. Thirdly, individuals with high MIA will experience a sense of competence *as a result of doing the PPI itself*, not just from reliving an event in which one was competent. As competence is a psychological need related to self-confidence (Sheldon, et al., 1996), participants with high MIA are therefore likely to experience higher levels of well-being. Based on these three reasons, it is evident that MIA is a salient individual difference factor that has the potential to increase the efficacy of PPIs.

The current study aims to, (1) provide further empirical support for (a) the general efficacy of TGT and BPS to increase well-being, and (b) the importance of effort and motivation towards these PPIs to increase well-being, and (2) examine the effects of MIA as a person-activity fit factor.

It was hypothesised that participants in the BPS and TGT groups would show an increase in well-being from Time 1 to Time 2, and from Time 1 to Time 3 compared to participants in the control group. It was also predicted that participants who report more effort and motivation towards completing the assigned activity would increase in well-being more than those reporting less effort and motivation. It was also hypothesised that intervention group participants with high MIA would show a greater increase in well-being from Time 1 to Time 2 and Time 1 to Time 3, than participants with low MIA.

In the current study, well-being was operationalised by measures of mental well-being, PA and NA; effort was measured by the number of times and the average time spent doing the activity; motivation was measured by a single question asking about the participant's motivation to undertake the activity; and MIA was operationalised by the sum of imagery vividness and controllability scores.

Method

Participants

Participants were 210 adult volunteers, comprising 157 females and 52 males (one participant did not report gender) with an age range of 18 to 74 years ($M = 34$, $SD = 13.99$). Of the 210 participants who completed Time 1, 76 (36%) also completed Time 2 and 38 (18%) also completed Time 3. Eighty-one per cent of participants were Australian residents and half had more than 16 years of formal education. Over half the sample were in a relationship (59%) and 41% in full time employment. The gender distribution in all three groups was generally equal with 25%, 21% and 28% male participants in each of the BPS ($n = 73$), TGT ($n = 70$) and Control groups ($n = 67$) respectively. All groups had an average age of 34 years. All other demographic characteristics were relatively consistent across groups, with the exception of the TGT group who had a lower percentage of individuals in full time employment (33 % compared to 46% and 43% in the BPS and control groups respectively).

Measures

Well-being measures.

Positive and negative affect.

The Positive and Negative Affect Schedule (PANAS) rated participants on 20 feelings and emotions they experienced in the past week (past two weeks at Time 3) including ‘distress’, ‘enthusiasm’ and ‘attentiveness’, scored on a five-point Likert scale from 1 (*very slightly or not at all*) to 5 (*extremely*). Scores for PA and NA range from 10 to 50, with higher scores indicating higher affect levels. Alpha coefficients of .86 (PA) and .87 (NA) indicate good internal consistency of the PANAS (Watson, Clark, & Tellegen, 1988). Support for the construct and factorial validity of the scale has also been demonstrated (Watson, et al.). Using the current study’s data, Cronbach’s alpha for PA was .90 and for NA was .87.

Mental well-being.

The Warwick-Edinburgh Mental Well-being Scale (WEMWBS) comprehensively measures mental well-being including affective-emotional components, cognitive-evaluative components and items relating to psychological functioning (Tennant, et al., 2007). The WEMWBS uses 14 items, such as “I’ve been feeling confident”, measured on a five-point Likert type scale from 1 (*none of the time*) to 5 (*all of the time*). Scores range from 14 to 70 with higher scores indicating higher levels of mental well-being. Criterion validity has been demonstrated through high correlations with well-being measures such as the PANAS – PA ($r = .71$) and the Scale of Psychological Well-Being ($r = .74$) (Tennant, et al.). Internal consistency based on Cronbach’s alpha is .91 for this measure (Stewart-Brown, et al., 2009) and test - retest reliability after one week is 0.83 (Tennant, et al.). Using the current study’s data, Cronbach’s alpha for the WEMWBS was .92.

Mental imagery ability measures.

Vividness.

The Shortened Questionnaire Upon Mental Imagery (SQMI; Sheehan, 1967b) measures vividness of mental imagery on seven sensory modalities: visual, auditory, cutaneous, kinaesthetic, olfactory, gustatory and organic. This 35-item version of Betts' (1909) original Questionnaire Upon Mental Imagery asks respondents to evaluate the vividness of their mental image (e.g. auditory image of "The whistle of a locomotive) on a scale of seven options. In this study, as has been done in previous studies (Watanabe, Fukuda, Hara, & Shirakawa, 2002), the response format was reversed from the original form so that higher scores indicate higher vividness of imagery. The rating scale used was 1 (*No image present at all*) to 7 (*Perfectly clear*) and scores ranged from 35 to 245. Test-retest reliability for this measure is satisfactory with a coefficient of .91 for a six-week period (Evans & Kamemoto, 1973) and .78 over a 7-month interval (Sheehan, 1967a). The SQMI is highly correlated ($r = .92$) with the original QMI. The validity of the long form has been demonstrated by high correlations between QMI scores and actual ability to generate images in experimental settings (Betts, 1909). Using the current study's data, Cronbach's alpha was .95.

Controllability.

The Test of Visual Imagery Control (TVIC; Gordon, 1949; Richardson, 1969) was used to measure the ability to control mental images. Original items were measured using 'clear', 'vague' and 'no image' as response items. As has been done previously (Gordon, 1949; Lequerica, Rapport, Axelrod, Telmet, & Whitman, 2002), 12 items were measured using a seven-point scale in this study to increase the sensitivity of the test. An example item is 'Can you see a car standing in front of a house?' to which respondents state the ease with which the scene was brought to their minds eye on a scale from 0 (*Cannot see the image at all*) to 6 (*Very easy*).

Controllability scores range from 0 to 72, with higher scores reflecting higher imagery control. Internal consistency for the TVIC is demonstrated by an alpha of .88 (Lequerica, et al.). The alpha coefficient for the current data set was .94.

Control measures.

In the current study gratitude and hope were controlled for as these constructs closely relate to an individual's level of well-being and the characteristics elicited through the PPIs, thus making them potentially confounding variables.

Gratitude.

The Gratitude Questionnaire –Six Item Form (GQ-6) asks respondents to rate how much they agree with items such as “I have so much in life to be thankful for”, on a scale ranging from 1 (*Strongly agree*) to 7 (*Strongly disagree*). Scores range from 6 to 42, with higher scores indicating higher gratitude. Alpha coefficients for the GQ-6 range from .76 to .84 and discriminant validity has been demonstrated with a number of measures such as hope, vitality, life satisfaction and optimism (McCullough, et al., 2002). Using the current study's data, Cronbach's alpha was .79.

Hope.

The Trait Hope Scale is a 12-item scale that asks respondents to rate how well each item (e.g. “My past experiences have prepared me well for my future”) relates to themselves, on an eight point Likert scale ranging from 1 (*Definitely false*) to 8 (*Definitely true*). The Trait Hope Scale is reliable with alpha coefficients ranging from .74 to .84 and convergent and discriminant validity have also been demonstrated with the Generalized Expectancy for Success Scale $r = .55$, $p = .005$, and NA $r = -.18$, $p < .05$ respectively (Snyder, et al., 1991). The alpha coefficient for the current sample's data was .90.

Socio-Demographic Information and Time 2 and 3 Follow-up Questions.

Demographic information was collected including, age, sex, nationality, education, employment, and income. Participants were also asked follow-up questions, at Time Two and Three. These included a question to measure motivation, “How motivated did you feel about doing the activity?” measured on a 5-point Likert scale from 1 (not at all) to 5 (extremely) and two questions regarding effort, “How many times during the week did you complete the activity?” and “On average how many minutes did it take you to complete your activity?”.

Procedure

Once ethics approval was gained participants were recruited from the general public through online discussion forums, a local newspaper advertisement, and posters and fliers. Interested individuals were instructed to go on-line to read the explanatory statement and commence the study via SurveyMethods. Submission of the first questionnaire was considered informed consent.

Participants completed questionnaires on three separate occasions: Time 1 (Pre-activity), Time 2 (Post-activity) and Time 3 (2 week Follow-up). Participants were randomly assigned to one of three groups: TGT, BPS and a no activity control group. The two intervention groups were asked to complete their assigned activity once per day for seven days. The instructions for the TGT exercise were based on those used by Seligman, Steen, Park and Peterson (2005) with the addition of an explicit mental imagery instruction, and was as follows:

“You have been randomly assigned to recall and imagine three good things that went well each day and a causal explanation for each good thing. “Recall and imagine” means to remember and create a mental image of each good thing you choose. In

creating your mental image try to use as many sensory modalities as possible (i.e. sight, sound, hearing, smell, taste, touch, feeling/emotion and sense of movement). You might find this task easier if you close your eyes. After creating each mental image, please write down your experience. Please do this for three good things that happened in your day. Please complete this exercise each day for the next 7 days starting today.”

The instructions for the BPS exercise were adapted from Sheldon and Lyubomirsky (2006), again with an additional emphasis on the use of mental imagery and was as follows:

“You have been randomly assigned to imagine your best possible self. “Imagine your best possible self” means that you imagine yourself in the future, after everything has gone as well as it possibly could. You have succeeded in accomplishing all of your life goals. Think of this as the realisation of your life dreams, and of your own best potentials. This involves identifying the best possible way that things might turn out in your life in order to help guide your decisions in the present. Imagine your best possible self using as many sensory modalities as possible (i.e. smell, sound, sight, taste, touch, feeling/emotion and sense of movement). It may help to close your eyes in doing this task before you write down what you have experienced. For the next 7 days we would like you to choose an area of your life and imagine your best possible self related to this domain. Choose a new domain each day.

Areas of your life may include but are not limited to the following:

Home, Fitness, Finances, Family, Children, Relationships, Friends, Romantic Partner, Career, Lifestyle, Personal Development, or Achievements, Work, Health (physical and mental), Leisure activities/hobbies, Spirituality.”

Participants were prompted to print or copy these instructions for reference when completing their assigned activity. Both these interventions involved using mental imagery hence, allowing an analysis of the effects of these interventions while considering MIA as a person-activity fit factor. Participants in the control group were not assigned an activity during the week. A flow chart of the procedure is presented in Figure 1.

Participants were given the option to continue doing their assigned activity for a following two weeks

TWO WEEKS LATER

Figure 1. Flowchart of procedure

Results

Preliminary Analyses

Data were analysed using PASW 18. Missing values (less than 5%) were replaced with the series mean before totals were computed. No multivariate outliers were identified using the Mahalanobis distance method, however three univariate outliers were identified based on z scores $> \pm 3.29$. These were truncated as recommended by Tabachnick and Fidell (2007). Based on examination of skew and kurtosis, all variables were normally distributed or aligned with previous findings supporting a slight skew towards positive mental health for Australians (Cummins, Eckersley, Pallant, van Vugt, & Misajon, 2003).

One-way ANOVAs conducted on baseline well-being (WEMWBS, $F(2,207) = 1.55, p = .21$; PA, $F(2,207) = 1.32, p = .27$; NA, $F(2,207) = 1.59, p = .21$) mental imagery (vividness, $F(2,207) = 1.11, p = .33$; controllability, $F(2,207) = .59, p = .56$) and control (gratitude, $F(2,206) = .87, p = .42$; hope, $F(2,207) = 1.18, p = .31$) indicated no significant differences across groups at Time 1. Similarly, no significant differences were found for all variables between participants that did not continue at

Time 2 and Time 3 compared to those who did continue to participate after Time 1. MIA scores were computed by summing the total scores for vividness and controllability for each participant. Three groups were then created in a tertile split, of high, medium and low MIA scores. At Time 1 there was a significant difference between high MIA and medium and low MIA on WEMWBS scores $F(2,207) = 10.97, p = .001$, partial eta squared = .10, and PA scores $F(2,207) = 14.48, p = .001$, partial eta squared = .12. People with high MIA had higher well-being. No significant differences occurred between MIA groups for NA, $F(2,207) = 1.79, p = .17$. In addition, participants significantly increased in MIA between Time 1 and Time 2, $F(1,72) = 11.31, p = .001$, partial eta squared = .14, but not between Time 2 and Time 3, $F(1,33) = .75, p = .40$. Two change score variables were created for all participants by subtracting Time 1 scores for the three well-being variables (mental well-being, PA & NA) from Time 2 scores and Time 3 scores respectively.

Main Analyses

The descriptive statistics for the three well-being measures across intervention groups across time are presented in Table 1.

Insert Table 1. about here

Table 1 demonstrates that for the BPS group, WEMWBS scores and PA increased at Time 2 and 3, while NA decreased at Time 2 but did not continue to decrease at Time 3. For the TGT group, both WEMWBS scores and PA increased at Time 2 but did not increase at Time 3 and NA decreased across both time points. Finally, the control group fluctuated such that, WEMWBS scores, PA and NA all increased slightly at Time 2 but then decreased at Time 3. Table 2 presents the means

and standard deviations of well-being across levels of mental imagery ability and group at Time 1 and 2.

Insert Table 2. about here

Table 2 shows that mean changes in well-being scores were more consistent for participants in the TGT and BPS groups, with medium and low MIA than participants with high MIA. Participants with medium and low MIA in the BPS and TGT groups increased in WEMWBS scores and PA and decreased in NA from Time 1 to Time 2. The degree of increase from Time 1 to Time 2 in WEMWBS scores increased as MIA declined for participants in the intervention groups. That is, people with low MIA increased more in WEMWBS scores than participants with high MIA. In contrast, participants with low MIA and high MIA had larger increases in PA and decreases in NA than participants with medium MIA. Interestingly, those with high MIA who were assigned to TGT compared to BPS, also increased WEMWBS and PA scores and decreased NA scores from pre to post assessment.

Table 3 presents the means and standard deviations of well-being across levels of imagery ability and group at Time 1 and 3. Due to the high attrition rate and subsequent small sample size at Time 3, Table 3 presents a median split (rather than turtle split) of MIA.

Insert Table 3. about here

Similarly to Table 2, Table 3 shows that in some instances participants with lower MIA experienced greater well-being changes (from Time 1 to Time 3) in the

expected direction than participants with high MIA, for participants in the intervention groups. Participants in the control group also increased in WEMWBS scores and decreased in NA. However their PA scores decreased.

To examine whether well-being had significantly increased as a result of completing the interventions and whether levels of MIA had significantly influenced increases in well-being at Time 2 (Post-Activity), two (for WEMWBS and NA), 3(BPS, TGT, Control) X 3(High, Medium and Low MIA) ANCOVAs were performed using Time 1 well-being scores as a covariate. The assumption for homogeneity of regression slopes was violated for PA therefore a 3x3 ANOVA was performed using change scores (PA at Time 2 minus PA at Time 1) as the DV. To test for significant differences at Time 3 (2-week Follow-Up), three, 3(BPS, TGT, Control) X 2 (high MIA, low MIA) ANCOVAs were performed for WEMWBS, PA and NA respectively again using Time 1 scores as a covariate. Due to the small sample at Time 3, a turtle split of MIA resulted in heterogeneity of variance. Consequently, as noted previously, a median split was used at Time 3 to ensure variability was adequately homogeneous.

The main effect for group was not significant for any of the analyses, WEMWBS2, $F(2,66) = 2.29, p = .11$, PAch2, $F(2,67) = 1.03, p = .36$, WEMWBS3, $F(2,31) = .30, p = .74$, PA3, $F(2,31) = 1.35, p = .27$, NA3, $F(2, 31) = .74, p = .49$ except for NA at Time 2, $F(2,66) = 4.2, p = .02$, partial eta squared = .11. NA mean scores at Time 2 were significantly lower in the BPS and TGT groups compared to the control group controlling for Time 1 NA.

The main effect for level of MIA was not significant at either time point, for any of the well-being measures, WEMWBS2, $F(2,66) = 1.68, p = .20$, PAch2, $F(2,67) = 1.81, p = .17$, NA2, $F(2,66) = .76, p = .47$, WEMWBS3, $F(1,31) = .09, p = .77$,

PA3, $F(1,31) = .01, p = .92$, NA3, $F(1,31) = .67, p = .42$. Likewise, the interaction between intervention group and MIA was not significant for any of the analyses, WEMWBS2, $F(4,66) = 1.80, p = .14$, PAch2, $F(4,67) = 1.74, p = .15$, NA2, $F(4,66) = .68, p = .61$, WEMWBS3, $F(2,31) = .62, p = .54$, PA3, $F(2,31) = .62, p = .54$, NA3, $F(2,31) = .45, p = .64$.

Table 4 displays correlations of motivation, frequency, and time spent doing the activity each time, with changes in well-being scores from Time 1 to Time 2 (Ch2) and Time 1 to Time 3 (Ch3).

Insert Table 4. about here

Table 4 shows that the more times participants completed the intervention the greater the increase in mental well-being and decrease in NA. Participants with greater motivation for doing the intervention also increased more in mental well-being and PA at Time 2 and mental well-being at Time 3.

ANCOVAs were used to analyse whether participants who submitted their activity responses to the research team increased in well-being more than participants who did not. Results revealed that participants who chose to submit their activity responses ($n=18$) at Time 2, decreased significantly more in NA at Time 2 $F(1,36) = 5.13, p = .03$, partial eta squared = .13, than participants in the intervention groups who did not submit their responses ($n = 21$). At Time 3 (follow-up) participants who submitted their responses ($n=10$) had increased significantly more in WEMWBS scores at Time 3 ($n = 10$), $F(1,20) = 7.28, p = .01$, partial eta squared = .27, than participants who did not submit their responses ($n = 13$).

Discussion

This study examined the effects of PPIs and MIA on increasing well-being. The first hypothesis predicted that participants who completed the BPS or TGT interventions would show an increase in well-being (mental well-being, PA) and decrease in NA, from Time 1 to Time 2, and from Time 1 to Time 3 compared to participants in the control group. This hypothesis was only supported for NA at Time 2. Despite non-significant results for the other measures of well-being at Time 2 and all measures at Time 3, the means changed in the predicted direction. The second hypothesis predicted that participants who reported more effort and motivation towards completing the assigned activity would demonstrate the greatest increases in well-being compared to those who reported less motivation and effort. This hypothesis was also partially supported as the number of times participants did the activity was significantly correlated with greater increases in mental well-being and decreases in NA and higher motivation was significantly positively related to greater increases in mental well-being and PA at Time 2. The third hypothesis, stating that intervention group participants with high MIA would show a greater increase in well-being from Time 1 to Time 2 and Time 1 to Time 3, compared to participants with low MIA, was not supported.

The present study, found that participants who completed TGT and BPS interventions were significantly lower in NA at Time 2 compared to participants in the control group, which supports the general efficacy of PPIs to reduce depressive symptoms. Consistent with both Seligman et al.'s (2005) finding and Sin and Lyubomirsky's (2009) meta-analysis, this finding demonstrates that the mechanisms involved in imagining and thinking about three good things or your best possible self, act to reduce negative emotions, thereby increasing well-being.

While NA was significantly lower at Time 2, this result was not significant at Time 3. One possible explanation for this is the high attrition rate between Time 2 and 3 (over 46%) compounded by the fact that few participants continued to do the activity (only 4 of 13 for the TGT and 6 of 11 for the BPS) after the first week (i.e. between Time 2 and 3). This indirectly supports the first hypothesis, as completing the intervention was predicted to be necessary for increasing well-being.

The finding of the current study that both TGT and BPS interventions did not significantly increase PA and mental well-being is inconsistent with previous studies such as Seligman, et al.'s, (2005) study which found that the TGT intervention increased well-being for six months after doing the intervention for one week. This inconsistency of results might result from the difference in follow-up time. Being followed up for six months, may have made participants in Seligman et al.'s study feel like it was worth persisting with the activity, thus generating greater increases in PA and mental well-being due to a higher motivation. The results for PA are also inconsistent with the findings of King (2001), Sheldon and Lyubomirsky (2006) and Peters, et al. (2010) that PA significantly increased after completing the BPS activity.

The current study asked participants to do an activity everyday for seven days, however a more optimum timing might be once a week for several weeks rather than daily for only one week. This less regular frequency would enable the activity to retain its full well-being inducing quality by resisting adaptation effects (Lyubomirsky, Sheldon, et al., 2005). This was the case in a study where participants who counted their blessings once a week increased in well-being significantly more than participants who counted them three times a week (Sheldon & Lyubomirsky, 2004). Furthermore, it is unlikely that one particular frequency will be ultimately effective for everyone and an irregular rather than regular timing might be optimally

beneficial for some people. The Architecture of Sustainable Change supports the notion that the benefit in volitional activities to increase well-being is somewhat dependent on the extent to which participants can vary *how* and *when* they engage in the activity (Lyubomirsky, Sheldon, et al., 2005). If this volitional control disappears, so too might the increase in well-being.

A lack of power due to insufficient group sizes can also account for the current non-significant findings in which the means trended in the expected direction but no significant differences were found. Power for the main effect of group ranged from .09 to .45, well below the recommended .80 (Pallant, 2007). While there were significant differences across groups for NA at Time 2, the mean scores demonstrate that the interventions led to increases in mental well-being and PA and decreases in NA across groups at both times. Given the time brevity for undertaking the interventions, and despite non-significance, these general trends in the means are indicative of the potential benefit of PPIs. Participants might have enjoyed some practical benefits and changes in mood and well-being throughout the one, or three week period that the measures were not sensitive enough to detect. For participants completing the TGT intervention, drawing attention to and being grateful for the positive aspects of life rather than the neutral or negative events, might have helped them to feel greater joy and meaning in life (Emmons & McCullough, 2003). Participants in the BPS intervention might have gained awareness of personal life goals and values through self-reflection (Sheldon & Lyubomirsky, 2006). Future research examining the qualitative data relating to well-being increases is needed to determine how the observed increases translate in people's lives.

The hypothesis, that greater effort and motivation would relate to greater increases in well-being was supported in the current study and is consistent with

previous research. For example in relation to effort, Seligman, et al. (2005), and Sheldon, et al. (2010) found that continued activity completion lead to greater increases in well-being. In the current study it was found that the number of times participants completed the activity significantly correlated with WEMWBS and NA change scores at both Time 2 and 3, thus supporting the Architecture of Sustainable Change, which suggests that continued effort is a necessary requisite for the beneficial outcomes of PPIs. The amount of time participants spent on the activity was not significantly correlated with well-being change scores suggesting that it is the number of different trials of the activity (frequency), not the length of each (duration) that is the important characteristic of effort and commitment in increasing well-being.

Similarly to effort, the current results for motivation support previous research by Sheldon and Elliot, (1999) and Sheldon and Houser-Marko (2001) which found that participants with greater self-concordant motivation for a personal goal increased more in well-being. Participants in the current study who were more motivated to do their assigned activity also experienced greater increases in mental well-being and PA at Time 2 and mental well-being at Time 3. Despite this, only 16% and 26% reported that they were ‘more than likely’ to continue the activity in the future at Time 2 and Time 3 respectively providing indirect support for most of the current study’s findings that well-being did not significantly increase. Outside of the confines of research however, individuals will typically choose which volitional activity, or which PPI to engage in, thus increasing the probability for self-concordant motivation and significant improvement in well-being.

Participants were given the choice of whether to submit their activity responses or not, and approximately half the participants did so. For example, a response to the TGT exercise was:

“1) I unexpectedly bumped into a friend in the city on the way out of a meeting, so it was a pleasant surprise. He was very chatty, so we caught up on all of his news. I felt excited to spend a short amount of time with him in an unexpected circumstance, yet connect again to each other as quickly as we did.

2) An old work colleague completed a hand-made patchwork quilt and gave it to me as a gift. The quilt is very colourful and is beautifully made, and I was touched at her generosity.

3) My partner wrote me a card which included a lot of intimate feelings and thoughts, and I felt feelings of love and affection. The card smelled musty, and I enjoyed looking at my partner's writing on the page.”

and to the BPS exercise:

“ My best possible family situation will ideally involve a close relationship with my immediate family throughout my life. I imagine meeting up regularly at all the family events like Christmas and mothers day, but also enjoying each other's company over a casual lunch, and having long chats over the phone. I imagine looking after my sister's children when she has some; taking them out for a day. I imagine being partnered myself with a family of my own.”

These responses demonstrate that participants who submitted their responses did the interventions as instructed, however there was no guarantee that participants (assigned to an intervention group) who did not submit their responses actually engaged with the activity appropriately, or at all. This possibility is demonstrated in the difference between increases in WEMWBS score increases and NA score decreases, which were greater for participants who submitted their responses. Participants, who report having done the activity, may do so due to a social desirability response bias, rather than because they have actually done the ascribed exercise.

The hypothesis that participants with high MIA would show a greater increase in well-being post-intervention compared to participants with low MIA, was not supported. These results are inconsistent with previous findings that people with high MIA responded with a higher emotional (fear) response than people with low MIA (Miller, et al., 1987). This inconsistency might suggest that imagery is more effective in eliciting negative emotions such as fear rather than positive emotions such as

happiness and joy. However, a study by Holmes, Mathews, Dalgleish, and Mackintosh (2006), found that participants who imagined positively resolved scenarios, reported greater increases in PA than participants who did not use imagery suggesting imagery can elicit both negative and positive emotions.

One explanation then, for the current results is that the association between emotion and imagery (Holmes & Mathews, 2010) is more dependent on *use* of imagery rather than *ability* (or quality) of mental imagery. This explanation is consistent with research by Holmes, Mathews, Mackintosh, and Dalgleish (2008), which found that people who use imagery to combine picture and word stimuli, elicited stronger emotional reactions than people who used a verbal description to combine the stimuli. Similarly, Holmes and Mathews (2005) found that participants instructed to imagine aversive scenarios experienced greater increases in reported anxiety than did participants instructed to focus on the verbal meaning of the same scenarios. These previous findings together with the current results suggest that using imagery as a method of processing (in addition to, but also in contrast to verbal processing) could increase the efficacy of PPIs to increase well-being regardless of an individuals' imagery ability. An alternative reason for the current non-significant findings is again a lack of power, which ranged from .05 to .53.

An interesting finding in the current study is that participants with high MIA were significantly higher in mental well-being and PA at Time 1 than participants with low and medium MIA. Given Miller et al.'s (1987) finding that high MIA is related to higher emotional responses, a possible reason that people with high MIA are significantly higher in mental well-being is that people with high MIA may naturally think about life in ways similarly to what the interventions asked them to do (i.e. creating images of the positive events in the day and imagining their goals and

values). This is supported by findings that the majority of experiences are pleasant and one's typical emotional state is mildly positive (Diener & Diener, 1996), which, suggests that vivid and controllable images in mentally healthy individuals are more often of positive content. On the other hand, the negativity bias proposes negative events have a greater impact than positive ones (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001), suggesting that people with high MIA are prone to have vivid mental images of negative events and therefore experience higher NA. The current results however, did not show any significant differences in NA between participants with high and low MIA. It was also found that participants significantly increased in MIA from Time 1 to Time 2, suggesting that mental imagery was embedded in the PPI tasks and that MIA can increase through practice. It could be extrapolated then, that participants with low MIA might, over time, be able to develop higher MIA as a potential route towards increasing well-being, whether this be through PPIs or other more explicit forms of mental imagery training.

The notion of person-activity fit, in which individuals' resources and skills are matched with a volitional activity and result in increased well-being, may not be ideal for all individual difference factors. As this study suggests, matching high MIA with mental imagery based activities does not produce the greatest increases in well-being. Similarly, a recent study by Giannopoulos and Vella-Brodrick (in press) found that when participants' orientation to happiness was matched with an activity promoting that same orientation to happiness, increases in well-being were smaller than when participants engaged with an activity promoting an orientation to happiness that was not their natural one. These findings suggest that increasing well-being may more efficiently occur through using novel methods and approaches that individuals are more receptive to and where these factors are associated with well-being, such as orientations to happiness and mental imagery. However, one aspect of person-activity

fit is a match between the task at hand and the context, including time demands and level of social support. Such aspects were not investigated in the current study but warrant further investigation.

A number of limitations exist in the current study. Firstly, the interventions were tested only over one week with a two week follow up and did not allow for the long term analysis of the effectiveness of PPIs. While similar time frames have been used in previous research, to sufficiently test the Architecture of Sustainable Change, ongoing programs of PPIs need to be examined. The aim of the current study was to first undertake a short term study focusing on the influence of mental imagery ability with the view to undertaking future longitudinal studies on factors which have shown short term effects on PPIs.

Secondly, the high attrition rate resulted in a small sample size at Time 3. While in itself a limitation, more importantly, this sample size influenced the decision to use a median split of MIA at Time 3 creating two groups (high and low MIA) in which participants in the middle range are forced into an extreme category. The result of this is that the two groups are not ideally representative of individuals with high and low MIA as the mean score for each group is bought towards the middle range and thus could potentially influence the significance of the results.

Finally, while participants were directed to use mental imagery in the PPIs, the anonymous nature of this study and more importantly the subjective and internal nature of imagery, means that there is no certainty that participants actually used mental imagery while completing their activities. In particular, the distance and anonymity between the researcher and participants may result in participants feeling little obligation to carry out the task exactly as directed. Researchers of future studies involving imagery may benefit from face to face meetings with participants to

encourage a higher rate of commitment to the study and the activity. Despite these limitations, notable strengths of this study were that it used an RCT design, participants were from the general population and individual difference factors were considered, such as MIA and motivation.

Further research into the relationship between MIA and well-being is needed to explore why people with higher MIA are naturally higher in well-being and whether quality or quantity of imagery has a more significant impact on affect and general mental well-being. Specifically, future research might directly test whether imagery use (compared to solely verbal thought) in PPIs increases a sense of need satisfaction despite imagery ability. Future research might also look at how mental imagery may be incorporated into other PPIs, or new PPIs may be developed based on mental imagery. To assist in measuring mental imagery and reducing the inherent difficulties of using self-report measures, future research in positive psychology using mental imagery could supplement subjective ratings of mental imagery with more objective measurement approaches focused on neurophysiological indicators (e.g., fMRI, EMG, EEG and ECG recordings).

This study has important implications for individuals and the wider community. The universal want and need to decrease psychological suffering, and to increase flourishing is highly prevalent considering the global burden of depression (Ustun, Ayuso-Mateos, Chatterji, Mathers, & Murray, 2004) and the plethora of self-help books now available. Research that can contribute to discovering effective and widely accessible means to meet such goals, can help to generate greater human potential and mental strength as well as alleviate suffering. More specifically, the current results encourage people with lower MIA to use imagery based PPIs while

people with higher MIA might seek alternative (non imagery based) PPIs as they are already close to the ceiling of imagery ability.

In conclusion, the current results demonstrate that volitional control, consistent effort and motivation are important factors in any pursuit to increase well-being. Fredrickson (2008) likened changing cognitive habits and mental well-being to moving a river; that is, it is possible to do, but is not simply done on a whim without serious intention and effort. While the PPIs in the current study used a mental imagery component, high MIA did not increase their efficacy to increase well-being. However, high MIA was positively associated with well-being and completion of the PPIs lead to increases in MIA. These findings suggest that well-being and the subsequent benefits of well-being can be fostered not only through imagery based PPIs, but through more direct methods, such as practicing imagery. Based on the previous research and the current study's findings, engaging regularly with imagery based PPIs which are aligned with individual difference factors such as motivation, can prove fruitful for individuals striving towards having fulfilling, happy lives.

References

- Baumeister, R. F., Bratslavsky, E., Finkenauer, C., & Vohs, K. D. (2001). Bad is stronger than good. *Review of General Psychology*, 5(4), 323-370. doi: 10.1037/1089-2680.5.4.323
- Betts, G. H. (1909). *Distribution and functions of mental imagery*. Oxford, England: Teachers College, Columbia University.
- Bryant, F. B. (2003). Savoring beliefs inventory (SBI): A scale for measuring beliefs about savouring. *Journal of Mental Health*, 12(2), 175-196. doi: 10.1080/0963823031000103489

- Carver, C. S., & Scheier, M. F. (2001). Optimism, pessimism, and self-regulation
Optimism & pessimism: Implications for theory, research, and practice (pp. 31-51). Washington, DC: American Psychological Association.
- Cummins, R. A., Eckersley, R., Pallant, J., van Vugt, J., & Misajon, R. (2003).
Developing a national index of subjective wellbeing: The Australian Unity
Wellbeing Index. *Social Indicators Research*, 64(2), 159-190. doi:
10.1023/A:1024704320683
- Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human
needs and the self-determination of behavior. *Psychological Inquiry*, 11(4),
227-268. doi: 10.1207/S15327965PLI1104_01
- Diener, E., & Diener, C. (1996). Most people are happy. *Psychological Science*, 7(3),
181-185. doi: 10.1111/j.1467-9280.1996.tb00354.x
- Diener, E., & Lucas, R. E. (1999). Personality and subjective well-being. In D.
Kahneman, E. Diener & N. Schwarz (Eds.), *Well-being: The foundations of
hedonic psychology* (pp. 213-229). New York: Russell Sage Foundation.
- Diener, E., Lucas, R. E., & Scollon, C. N. (2006). Beyond the hedonic treadmill:
Revising the adaptation theory of well-being. *American Psychologist*, 61(4),
305-314. doi: 10.1037/0003-066X.61.4.305
- Diener, E., Suh, E. M., Lucas, R. E., & Smith, H. L. (1999). SWB: Three decades of
progress. *Psychological Bulletin*, 125, 276-302. doi: [10.1037/0033-
2909.125.2.276](https://doi.org/10.1037/0033-2909.125.2.276)
- Eid, M., & Larsen, R. J. (2008). *The science of subjective well-being*. New York:
Guilford Press.
- Emmons, R. A. (1986). Personal strivings: An approach to personality and subjective
well-being. *Journal of Personality and Social Psychology*, 51(5), 1058-1068.
doi: 10.1037/0022-3514.51.5.1058

- Emmons, R. A., & McCullough, M. E. (2003). Counting blessings versus burdens: An experimental investigation of gratitude and subjective well-being in daily life. *Journal of Personality and Social Psychology*, 84(2), 377-389. doi: 10.1037/0022-3514.84.2.377
- Evans, I. M., & Kamemoto, W. S. (1973). Reliability of the short form of Betts' Questionnaire on Mental Imagery: Replication. *Psychological Reports*, 33(1), 281-282.
- Fredrickson, B. L. (2008). Promoting positive affect *The science of subjective well-being* (pp. 449-468). New York: Guilford Press.
- Gable, S. L., & Haidt, J. (2005). What (and why) is positive psychology? *Review of General Psychology*, 9(2), 103-110. doi: 10.1037/1089-2680.9.2.103
- Giannopoulos, V. L. & Vella-Brodrick, D. A. (in press). Effects of positive interventions and Orientations to Happiness on subjective well-being. *Journal of Positive Psychology*.
- Gordon, R. (1949). An investigation into some of the factors that favour the formation of stereotyped images. *British Journal of Psychology*, 39, 156-167.
- Hassed, C. (2008). Mindfulness, wellbeing and performance. *NeuroLeadership Journal*, 1(1), 53 - 60.
- Holmes, E. A., & Mathews, A. (2005). Mental imagery and emotion: A specialrelationship? *Emotion*, 5(4), 489-497. doi: 10.1037/1528-3542.5.4.489
- Holmes, E. A., & Mathews, A. (2010). Mental imagery in emotion and emotional disorders. *Clinical Psychology Review*, 30(3), 349-362. doi: 10.1016/j.cpr.2010.01.001
- Holmes, E. A., Mathews, A., Dalgleish, T., & Mackintosh, B. (2006). Positive Interpretation Training: Effects of mental imagery versus verbal training on

- positive mood. *Behavior Therapy*, 37(3), 237-247. doi: 10.1016/j.beth.2006.02.002
- Holmes, E. A., Mathews, A., Mackintosh, B., & Dalgleish, T. (2008). The causal effect of mental imagery on emotion assessed using picture-word cues. *Emotion*, 8(3), 395-409. doi: 10.1037/1528-3542.8.3.395
- Kashdan, T. B., Biswas-Diener, R., & King, L. A. (2008). Reconsidering happiness: The costs of distinguishing between hedonics and eudaimonia. *Journal of Positive Psychology*, 3(4), 219-233.
- Keyes, C. L. (2007). Promoting and protecting mental health as flourishing: A complementary strategy for improving national mental health. *American Psychologist*, 62(2), 95-108. doi: 10.1037/0003-066X.62.2.95
- King, L. A. (2001). The health benefits of writing about life goals. *Personality and Social Psychology Bulletin*, 27(7), 798-807. doi: 10.1177/0146167201277003
- Kosslyn, S. M., & Thompson, W. L. (2003). When is early visual cortex activated during visual mental imagery? *Psychological Bulletin*, 129(5), 723-746. doi: 10.1037/0033-2909.129.5.723
- Kwekkeboom, K., Huseby-Moore, K., & Ward, S. (1998). Imaging ability and effective use of guided imagery. *Research in Nursing and Health*, 21(3), 189-198. doi: 10.1002/%28SICI%291098-240X%28199806%2921:3%3C189::AID-NUR2%3E3.0.CO;2-D
- Lequerica, A., Rapport, L., Axelrod, B. N., Telmet, K., & Whitman, R. (2002). Subjective and objective assessment methods of mental imagery control: Construct validation of self-report measures. *Journal of Clinical and Experimental Neuropsychology*, 24(8), 1103-1116. doi: 10.1076/jcen.24.8.1103.8370

- Linley, P., Maltby, J., Wood, A. M., Osborne, G., & Hurling, R. (2009). Measuring happiness: The higher order factor structure of subjective and psychological well-being measures. *Personality and Individual Differences*, 47(8), 878-884. doi: 10.1016/j.paid.2009.07.010
- Lykken, D., & Tellegen, A. (1996). Happiness is a stochastic phenomenon. *Psychological Science*, 7(3), 186-189. doi: 10.1111/j.1467-9280.1996.tb00355.x
- Lyubomirsky, S., King, L., & Diener, E. (2005). The benefits of frequent positive affect: Does happiness lead to success? *Psychological Bulletin*, 131(6), 803-855. doi: 10.1037/0033-2909.131.6.803
- Lyubomirsky, S., Sheldon, K. M., & Schkade, D. (2005). Pursuing happiness: The architecture of sustainable change. *Review of General Psychology*, 9(2), 111-131. doi: 10.1037/1089-2680.9.2.111
- Martin, K. A., Moritz, S. E., & Hall, C. R. (1999). Imagery use in sport: A literature review and applied model. *The Sport Psychologist*, 13(3), 245-268.
- McCullough, M. E., Emmons, R. A., & Tsang, J.-A. (2002). The grateful disposition: A conceptual and empirical topography. *Journal of Personality and Social Psychology*, 82(1), 112-127. doi: 10.1037/0022-3514.82.1.112
- Miller, G. A., Levin, D. N., Kozak, M. J., Cook, E. W., McLean, A., & Lang, P. J. (1987). Individual differences in imagery and the psychophysiology of emotion. *Cognition and Emotion*, 1(4), 367-390. doi: 10.1080/02699938708408058
- Murphy, S. M., & Jowdy, D. P. (1992). Imagery and mental practice. In T. S. Horn (Ed.), *Advances in sport psychology* (pp. 221-250). Champaign, IL, England: Human Kinetics Publishers.
- Pallant, J. (2007). *SPSS: Survival manual*. Crows Nest: NSW: Allen & Unwin.

- Peters, M. L., Flink, I. K., Boersma, K., & Linton, S. J. (2010). Manipulating optimism: Can imagining a best possible self be used to increase positive future expectancies? *The Journal of Positive Psychology*, 5(3), 204-211. doi: 10.1080/17439761003790963
- Richardson, A. (1969). *Mental Imagery*. London: Routledge and Kegan Paul.
- Ryan, R. M. (1995). Psychological needs and the facilitation of integrative processes. *Journal of Personality*, 63(3), 397-427. doi: 10.1111/j.1467-6494.1995.tb00501.x
- Ryff, C. D., & Keyes, C. L. M. (1995). The structure of psychological well-being revisited. *Journal of Personality and Social Psychology*, 69(4), 719-727. doi: 10.1037/0022-3514.69.4.719
- Schimmack, U. (2008). The structure of subjective well-being. In M. Eid & R. J. Larsen (Eds.), *The science of subjective well-being* (pp. 97-123). New York: Guilford Press.
- Seligman, M. E., & Csikszentmihalyi, M. (2000). Positive psychology: An introduction. *American Psychologist*, 55(1), 5-14. doi: 10.1037/0003-066X.55.1.5
- Seligman, M. E., Steen, T. A., Park, N., & Peterson, C. (2005). Positive psychology progress: Empirical validation of interventions. *American Psychologist*, 60(5), 410-421. doi: 10.1037/0003-066X.60.5.410
- Sheehan, P. W. (1967a). Reliability of a short test of imagery. *Perceptual and Motor Skills*, 25(3), 744.
- Sheehan, P. W. (1967b). A shortened form of Betts' Questionnaire upon Mental Imagery. *Journal of Clinical Psychology*, 23(3), 386-389. doi: 10.1002/1097-4679%28196707%2923:3%3C386::AID-JCLP2270230328%3E3.0.CO;2-S

- Sheldon, K. M., Abad, N., Ferguson, Y., Gunz, A., Houser-Marko, L., Nichols, C. P., & Lyubomirsky, S. (2010). Persistent pursuit of need-satisfying goals leads to increased happiness: A 6-month experimental longitudinal study. *Motivation and Emotion*, 34(1), 39-48. doi: 10.1007/s11031-009-9153-1
- Sheldon, K. M., & Elliot, A. J. (1999). Goal striving, need satisfaction, and longitudinal well-being: The self-concordance model. *Journal of Personality and Social Psychology*, 76(3), 482-497. doi: 10.1037/0022-3514.76.3.482
- Sheldon, K. M., & Houser-Marko, L. (2001). Self-concordance, goal attainment, and the pursuit of happiness: Can there be an upward spiral? *Journal of Personality and Social Psychology*, 80(1), 152-165. doi: 10.1037/0022-3514.80.1.152
- Sheldon, K. M., & Lyubomirsky, S. (2004). Achieving sustainable new happiness: Prospects, practices, and prescriptions. In P. A. Linley & S. Joseph (Eds.), *Positive psychology in practice* (pp. 127-145). Hoboken: John Wiley & Sons Inc.
- Sheldon, K. M., & Lyubomirsky, S. (2006). How to increase and sustain positive emotion: The effects of expressing gratitude and visualizing best possible selves. *The Journal of Positive Psychology*, 1(2), 73-82. doi: 10.1080/17439760500510676
- Sheldon, K. M., Ryan, R., & Reis, H. T. (1996). What makes for a good day? Competence and autonomy in the day and in the person. *Personality and Social Psychology Bulletin*, 22(12), 1270-1279. doi: 10.1177/01461672962212007
- Sin, N. L., & Lyubomirsky, S. (2009). Enhancing well-being and alleviating depressive symptoms with positive psychology interventions: A practice-

- friendly meta-analysis. *Journal of Clinical Psychology*, 65(5), 467-487. doi: 10.1002/jclp.20593
- Snyder, C., Harris, C., Anderson, J. R., Holleran, S. A., Irving, L. M., Sigmon, S. T., et al. (1991). The will and the ways: Development and validation of an individual-differences measure of hope. *Journal of Personality and Social Psychology*, 60(4), 570-585. doi: 10.1037/0022-3514.60.4.570
- Stewart-Brown, S., Tennant, A., Tennant, R., Platt, S., Parkinson, J., & Weich, S. (2009). Internal construct validity of the Warwick-Edinburgh Mental Well-Being Scale (WEMWBS): A Rasch analysis using data from the Scottish Health Education Population Survey. *Health and Quality of Life Outcomes*, 7(1), 15-22. doi: 10.1186/1477-7525-7-15
- Tabachnick, B. G., & Fidell, L. S. (2007). Using multivariate statistics (5th ed.). Boston: Allyn and Bacon.
- Tennant, R., Hiller, L., Fishwick, R., Platt, S., Joseph, S., Weich, S., ... Stewart-Brown, S. (2007). The Warwick-Edinburgh mental well-being scale (WEMWBS): Development and UK validation. *Health and Quality of Life Outcomes*, 5(1), 63-75. doi: 10.1186/1477-7525-5-63
- Ustun, T., Ayuso-Mateos, J., Chatterji, S., Mathers, C., & Murray, C. (2004). Global burden of depressive disorders in the year 2000. *British Journal of Psychiatry*, 184(5), 386-392. doi: 10.1192/bjp.184.5.386
- Watanabe, E., Fukuda, S., Hara, H., & Shirakawa, T. (2002). Altered responses of saliva cortisol and mood status by long-period special yoga exercise mixed with meditation and guided imagery. *Journal of International Society of Life Information Science*, 20(2), 585-587.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of*

Personality and Social Psychology, 54(6), 1063-1070. doi: 10.1037/0022-

3514.54.6.1063

Table 1

Means and Standard Deviations for the BPS, TGT and Control groups for Well-Being Measures at Time 1 (pre-activity), Time 2 (post-activity) and Time 3 (two-week follow-up)

Measure	Group	WEMWBS	PA	NA	
		<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>n</i>
T1	BPS	50.59 (8.4)	33.50 (2.25)	21.86 (1.92)	73
	TGT	49.03 (8.95)	35.18 (1.97)	18.45 (2.12)	70
	Control	48.03 (8.73)	29.54 (1.77)	21.15 (2.26)	67
T2	BPS	54.26 (8.39)	35.5 (1.76)	18.07 (1.72)	21
	TGT	54.47 (7.14)	36.02 (2.32)	17.00 (2.28)	25
	Control	49.97 (7.2)	30.96 (2.3)	23.69 (1.96)	30
T3	BPS	56.14 (7.28)	37.16 (2.23)	18.50 (2.26)	14
	TGT	53.91 (11.24)	35.09 (2.36)	15.55 (1.79)	11
	Control	49.38 (10.29)	29.77 (2.3)	20.85 (2.45)	13

Note. WEMWBS = Warwick-Edinburgh Mental Well-Being Scale, PA = Positive Affect, NA = Negative Affect, M = Mean, SD = Standard Deviation T1 = Time 1 (Pre-activity), T2 = Time 2 (Post-activity) and T3 = Time 3 (Follow-up). BPS = Best Possible Selves, TGT = Three Good Things, WEMWBS scores range from 14 to 70. PA and NA scores range from 10 to 50. Different sample sizes across groups at Time 1 are due to the random allocation of participants. Different sample sizes across time are due to attrition.

Table 2

Means and Standard Deviations of Mental Well-Being, PA and NA, for High, Medium and Low MIA across Groups at Time 1 and 2

		T1 Well-Being				T2 Well-Being			
		Well-Being Measure							
	Group	WEMWBS	PA	NA		WEMWBS	PA	NA	
		<i>M</i>	<i>M</i>	<i>M</i>	<i>n</i>	<i>M</i>	<i>M</i>	<i>M</i>	<i>n</i>
		(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)		(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	
High	BPS	55.26	38.86	18.29	27	56.44	37.75	20.25	8
MIA		(7.88)	(7.07)	(7.53)		(9.75)	(3.73)	(10.21)	
	TGT	52.14	33.29	20.94	21	56.75	41	16.4	5
		(8.48)	(7.46)	(7.3)		(8.07)	(4.74)	(3.29)	
	Control	50.80	36.62	19.57	21	51.92	35.87	20.75	12
		(7.49)	(6.25)	(7.35)		(8.22)	(5.45)	(8.58)	
Medium	BPS	48.59	31.5	22.64	22	51.33	33.33	20	6
MIA		(7.58)	(8.35)	(7.42)		(5.61)	(4.76)	(4.24)	
	TGT	49.34	32.29	18.61	28	52	33.03	18.56	9
		(7.06)	(7.12)	(5.78)		(7.66)	(7.93)	(7.60)	
	Control	46.71	30.90	23.27	21	50.8	32.4	24.6	5
		(10.80)	(7.29)	(8.33)		(8.7)	(8.2)	(8.91)	
Low	BPS	47.17	30.33	20.08	24	54.29	34.61	15.86	7
MIA		(7.53)	(7.96)	(6.39)		(9.09)	(9.33)	(4.18)	
	TGT	45.5	29.87	21.71	21	55.45	34.55	17.82	11
		(10.68)	(9.07)	(7.93)		(6.35)	(6.79)	(5.46)	
	Control	46.80	29.17	23.47	25	47.85	29.92	22.69	13

(7.46) (7.31) (7.88) (5.4) (6.12) (4.89)

Note. MIA = Mental Imagery Ability, WEMWBS = Warwick-Edinburgh Mental Well-Being Scale, PA = Positive Affect, NA = Negative Affect, M = mean, SD = Standard Deviation, T1 = Time 1 (Pre-activity), T2 = Time 2 (Post-activity). WEMWBS scores range from 14 to 70. PA and NA scores range from 10 to 50. BPS = Best Possible Selves, TGT = Three Good Things,

Table 3

Means and Standard Deviations of Mental Well-Being, PA and NA, for High and Low MIA across Groups at Time 1 and 3

		Mental Imagery Ability							
		High				Low			
Group		WEMWBS	PA	NA		WEMWBS	PA	NA	
		<i>M</i>	<i>M</i>	<i>M</i>	<i>n</i>	<i>M</i>	<i>M</i>	<i>M</i>	<i>n</i>
		(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)		(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	
T1	BPS	53.58	37.86	19.72	36	47.68	29.92	20.65	37
		(8.05)	(7.27)	(7.75)		(7.78)	(8.02)	(6.83)	
	TGT	52.43	33.97	19.27	36	45.43	29.62	21.27	34
		(7.6)	(7.55)	(7.3)		(8.96)	(7.66)	(7.04)	
	Control	49.35	34.87	21.57	31	46.89	29.62	22.71	36
		(9.63)	(7.52)	(8.34)		(7.83)	(6.85)	(7.66)	
T3	BPS	56.83	39.22	21	6	55.63	35.63	16.63	8
		(9.89)	(8.36)	(12)		(5.29)	(8.55)	(4.47)	
	TGT	54	35	17	5	53.83	35.17	14.33	6
		(13.19)	(8.63)	(5.5)		(10.65)	(7.91)	(6.47)	
	Control	51.75	33	18.75	4	48.33	28.33	21.78	9
		(13.48)	(6.32)	(10.47)		(9.31)	(8.97)	(8.51)	

Note. WEMWBS = Warwick-Edinburgh Mental Well-Being Scale, PA = Positive Affect, NA = Negative Affect, M = mean, SD = Standard Deviation, WEMWBS scores range from 14 to 70. PA and

NA scores range from 10 to 50. BPS = Best Possible Selves, TGT = Three Good Things, T1 = Time 1 (Pre-activity), T3 = Time 3 (Follow-up).

Table 4

Correlations of Motivation, Activity Frequency and Average Time Taken to do the Activity with Well-Being Change Scores

	WEMWBS	WEMWBS	PA	PA	NA	NA
	Ch2	Ch3	Ch2	Ch3	Ch2	Ch3
Motivation	.53**	.55**	.47**	.37	-.11	-.09
	N=41	N=25	N=41	N=25	N=41	N=25
No. of	.48**	.56**	.12	.05	-.31*	-.55**
times	N=41	N=24	N=41	N=24	N=41	N=24
Time	-.04	.22	-.27	-.12	.01	.24
taken	N=40	N=23	N=40	N=23	N=40	N=23

Note: ** denotes Significance at $p < .001$; and * denotes Significance at $p < .01$. WEMWBS = Warwick-Edinburgh Mental Well-Being Scale, PA = Positive Affect, NA = Negative Affect, M = mean, SD = Standard Deviation, Ch2 = mean score at T2 minus mean at T1, Ch3 = mean score at T3 minus mean at T1.

Minerva Access is the Institutional Repository of The University of Melbourne

Author/s:

Odou, N;Vella-Brodrick, DA

Title:

The Efficacy of Positive Psychology Interventions to Increase Well-Being and the Role of Mental Imagery Ability

Date:

2013-01-01

Citation:

Odou, N. & Vella-Brodrick, D. A. (2013). The Efficacy of Positive Psychology Interventions to Increase Well-Being and the Role of Mental Imagery Ability. SOCIAL INDICATORS RESEARCH, 110 (1), pp.111-129. <https://doi.org/10.1007/s11205-011-9919-1>.

Persistent Link:

<http://hdl.handle.net/11343/282631>