Chapter 7

Optimism: identifying a modifiable cognitive marker to promote wellbeing

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Abstract

Optimism is associated with a range of benefits not only for general wellbeing, but also for mental and physical health. The development of psychological interventions to boost optimism derived from emotion research would have the potential to provide significant public health benefits, yet cognitive markers of optimism are little understood. The current study aimed to take a first step in this direction by identifying a cognitive marker for optimism that could provide a modifiable target for innovative interventions. In particular we predicted that the ability to generate vivid positive mental imagery of the future would be associated with dispositional optimism. A community sample of 237 participants completed a survey comprising measures of mental imagery and optimism, and socio-demographic information. Vividness and sense of likelihood of positive future imagery were significantly associated with optimism, even when adjusting for socio-demographic factors and general imagery ability. The ability to generate vivid mental imagery of positive future events may provide a modifiable cognitive marker of optimism. Boosting positive future imagery could provide a cognitive target for treatment innovations to promote optimism, with implications for emotional and even physical wellbeing.

Introduction

Why is it that some people see the future as bright and full of potential, whereas for others it holds only uncertainty or apprehension? Dispositional optimism refers to the tendency to have generalized positive expectancies about the future (Carver, Scheier, & Segerstrom, 2010). Most people show an "optimism bias", expecting positive events rather than negative events to happen in the future, even without supporting evidence (Weinstein, 1980).

It has been argued that optimism is adaptive and an important product of human evolution (Sharot, 2011). An increasing body of evidence suggests that optimism has an impact not only on general wellbeing, but also on mental and physical health (Carver *et al*., 2010). Longitudinal studies have demonstrated that higher levels of optimism are associated with lower cumulative incidence of depression symptoms over a 15-year period (Giltay, Zitman, & Kromhout, 2006), with reduced risk of future cardiovascular disease in a range of populations (Boehm, Peterson, Kivimaki, & Kubzansky, 2011; Giltay, Kamphuis, Kalmijn, Zitman, & Kromhout, 2006; Tindle *et al*., 2009), and even with reduced rate of death (Giltay, Geleijnse, Zitman, Hoekstra, & Schouten, 2004). Optimism is thus linked to positive outcomes in areas that represent huge public burdens of disease such as depression and cardiovascular disease (World Health Organisation, 2004). In the context of the need to develop inexpensive and accessible treatment options (Simon & Ludman, 2009), optimism presents a target for a low-intensity psychological interventions in these areas.

Although some psychological interventions to increase optimism have been described (e.g. Meevissen, Peters, & Alberts, 2011; Riskind, Sarampote, & Mercier, 1996), they have been derived from existing techniques from cognitive behavioural therapy or social psychology. To our knowledge, an empirically-driven treatment based on an understanding of optimism in terms of cognitive and emotional processes is lacking. Developing such an understanding using an "experimental medicine" approach (Rutter & Plomin, 2009) could drive more targeted treatment innovation. This corresponds to the "basic science discovery" phase in the development of new interventions (Thornicroft, Lempp, & Tansella, in press).

A potential neural substrate for optimism has been suggested. Sharot, Riccardi, Raio, and Phelps (2007) found increased activation in the right Anterior Cingulate Cortex (rACC) when participants imagined positive future events, compared to when they imagined negative future events. Furthermore, this relative level of rACC activation was greater for participants with higher levels of self-reported optimism. While the identification of brain regions per se does not easily lend itself to novel treatment development, this study suggests a potentially modifiable cognitive marker: the paradigm used involved the generation of mental imagery, that is, imagining autobiographical episodes.

We propose that a candidate cognitive marker for optimism is the ability to generate vivid mental images of positive events occurring in the future. Imagining the future may play a key role in our day-to-day functioning and has been the subject of much recent research interest (e.g. Addis, Pan, Vu, Laiser, & Schacter, 2009; Crisp, Birtel, & Meleady, 2011; D'Argembeau, Renaud, & Van der Linden, 2011; Schacter, Addis, & Buckner, 2008). Compared to verbal thought, mental imagery has a powerful effect on emotion (Holmes, Coughtrey, & Connor, 2008; Holmes & Mathews, 2005), and thus mental images may be a particularly powerful form of future thinking. What evidence might support our hypothesis? Sharot *et al*. (2007) found that participants reporting higher levels of optimism were more likely to expect the positive events they imagined to happen closer in the future than negative events, and were more likely to experience them with a greater sense of "pre-experiencing".

On the other hand, people with depressed mood showed reduced ability to generate vivid mental images of positive future events (Holmes, Lang, Moulds, & Steele, 2008). Further, Morina, Deeprose, Pusowski, Schmid, and Holmes (in press) found that patients with major depressive disorder and those with anxiety disorders showed reduced ability to generate vivid mental images of positive future events compared to healthy controls, and also rated the events as less likely to occur in the near future. While convergent evidence from both ends of the optimism spectrum suggest that positive future imagery may be important, a key part of the puzzle is missing. That is, in the general population, is optimism associated with greater ability to generate vivid mental images of positive events in the future?

The current study aimed to test the hypothesis that within a large community sample, higher levels of optimism would be associated with the ability to generate more vivid mental imagery of positive future events. We predicted that this relationship would remain significant when adjusting for other potentially confounding variables.

Method

Participants

The study sample was drawn from the Routine Outcome Monitoring (ROM; de Beurs *et al*., 2011) reference study. The ROM reference study comprised a randomly selected population-based sample of Dutch participants aged 18-65, recruited via invitation through their general practitioner. As a reference sample, participants with cognitive difficulties such as dementia, or receiving treatment for a psychiatric disorder within the past 6 months were excluded. The 547 people in the reference study who had agreed to be contacted for research were invited by letter to participate, with the questionnaires and return envelope enclosed, and 258 elected to take part1. Twenty-one participants returned incomplete questionnaires and were excluded, leaving a final sample of 237 (152 men and 85 women).

Measures

Socio-demographic variables (e.g. age, gender, education) were collected as part of the ROM reference study. For the current study, participants further completed the following questionnaires:

Life Orientation Test – Revised (LOT-R; Scheier, Carver, & Bridges, 1994).

This 10-item questionnaire was used to assess dispositional optimism. Items were rated on a 5-point scale from 0 (strongly disagree) to 4 (strongly agree). Three items were positively-worded (e.g. "I'm always optimistic about my future"), three were negatively-worded and reverse-scored (e.g. "I hardly ever expect things to go my way"), and four were filler and not scored. Higher total scores (ranging from 0 through 24) were indicative of higher levels of optimism. The LOT-R has been used in numerous studies investigating optimism (Carver *et al*., 2010), and Scheier *et al*. (1994) report acceptable internal consistency (á = .78), as well as good convergent and discriminant validity.

Prospective Imagery Test (PIT; Holmes, Lang, et al., 2008; Stöber, 2000).

The PIT is a measure of deliberately-generated positive and negative mental images of potential future events. Participants were presented with 10 positive and 10 negative future scenarios and generated a mental image of each. Participants rated the vividness of each image on a scale from 1 (no image at all) to 5 (very vivid). To obtain further information about

the quality of imagery generated (cf. Sharot *et al*., 2007), participants rated their perceived "likelihood" of each event occurring in the near future from 1 (not at all) to 7 (completely), and to what extent they felt that they were "experiencing" each event while imagining it from 1 (not at all) to 7 (completely). In the current study we were primarily interested in responses to the positive items, and included the negative items to control for general ability to generate future imagery. As internal consistency had not previously been reported for subscales of the PIT, we calculated Cronbach's á for our sample. All subscales demonstrated good internal consistency (.83 < á < .90).

Spontaneous Use of Imagery Scale (Reisberg, Pearson, & Kosslyn, 2003).

This 12-item questionnaire was included to control for everyday imagery use. Participants rated items such as ''When I think about visiting a relative, I almost always have a clear mental picture of him or her'' on a scale from 1 (never appropriate) to 5 (always appropriate). Reisberg *et al*. (2003) report excellent internal consistency (á = .98) and good convergent validity.

Results

Table 1 presents descriptive statistics for socio-demographic information2 and measures of imagery (SUIS and PIT), and corresponding zero-order correlations with score on the LOT-R (M = 17.09, SD = 4.37). Vividness, likelihood and experiencing ratings for positive items of the PIT each correlated significantly with score on the LOT-R, suggesting that each of these qualities of the positive future imagery generated was significantly associated with higher levels of optimism.

Hierarchical regression was used to investigate whether the qualities of positive future imagery generated predicted optimism when controlling for other variables. In step 1, socio-demographic variables were entered as control variables. In step 2, the control imagery measures were entered (SUIS, negative PIT subscales). In step 3, the positive subscales of the PIT were entered. Table 1 summarises the regression. Adding the positive subscales of the PIT significantly improved the fit of the model (ÄR2 = .21, ÄF(3, 219) = 24.31, p < .001). In the final model, higher ratings for both vividness and likelihood of positive items on the PIT were significantly associated with higher scores on the LOT-R, and higher experiencing ratings for positive items on the PIT were significantly associated with lower scores on the

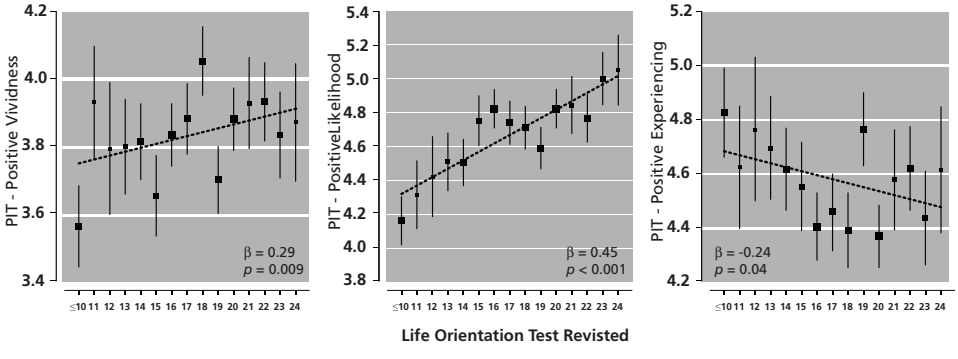

Figure 1. The mean standard scores for the Prospective Imagery Test (PIT) subscales for "vividness", "likelihood" and "experiencing" each event while imagining it in relation to the categorized dispositional optimism score (on the Life orientation test – revised [LOT-R]). The size of each square is proportional to the number of participants. Vertical lines indicate standard errors, and multivariable dashed regression lines are shown. Scores were adjusted as described in Model 3.

Table 1.

Descriptive Statistics and Hierarchical Multiple Regression Analyses Predicting Scores on the Life Orientation Test – Revised via Socio-demographic Data and Measures of Imagery

Predictor	M (SD)	r0	Model 1	Model 2	Model 3
			β	β	β
Age (years)	43.11 (12.61)	.05	.09	.09	.19**
Gender	n (%)				
Female	85 (36%)	.02	-.02	-.005	-.03
Married / Cohabiting	164 (69%)	.22***	.07	.03	.08
Living alone	42 (18%)	-.27***	-.19*	-.19*	-.12
University level education	196 (83%)	.08	.10	.11	.04
Dutch Nationality	231 (98%)	.07	.08	.09	.04
Current smoker	44 (19%)	-.09	-.05	-.04	.001
No or hardly any alcohol use	23 (10%)	-.10	-.05	-.02	.001
Health status					
Self-rated "healthy"	221 (93%)	.20**	0.16*	.13*	.03
Serious illness diagnosed	47 (20%)	.07	0.06	.06	.04
SUIS	35.15 (8.56)	-.03		.009	-.05
PIT-Negative					
Vividness	2.81 (0.97)	-.08		.11	-.09
Likelihood	2.86 (0.97)	-.24***		-.24*	-.19*
Experiencing	2.84 (1.25)	-.15*		-.03	.07
PIT-Positive					
Vividness	3.88 (0.68)	.44***			.29**
Likelihood	4.72 (0.99)	.45***			.45***
Experiencing	4.53 (1.18)	.30***			-.24*
Adjusted R^2			.09	.12	.33
ΔR^2				.04	.21
F for ΔR^2				2.74*	24.31***
Model *F*			3.26**	3.18***	7.74***

Note. N = 237. Model 1 includes socio-demographic variables only. Model 2 additionally includes control imagery variables. Model 3 additionally includes positive future imagery variables. r0 = zero order correlations. SUIS = Spontaneous Use of Imagery Scale. PIT-Negative/Positive = Prospective Imagery Test Positive/Negative items.

*** p < .05. ** p < .01. *** p < .001.**

LOT-R (Figure 1). The only other variables with significant regression coefficients were the likelihood ratings for negative items of the PIT, and age. Examination of residuals plots revealed no multivariate outliers, and no problems with collinearity were identified (inspection of Tolerance/Variance Inflation Factors; Clark-Carter, 2010).

Discussion

This study is the first, to our knowledge, to test the prediction that the ability to generate vivid positive mental imagery of the future is associated with dispositional optimism. Data from a large community sample supported this association. The relationship was significant when controlling for socio-demographic factors and general mental imagery ability. This suggests that further research is warranted in investigating positive future imagery as a potential cognitive marker for optimism and a target for treatment innovation or even prevention in, for example, depression and cardiovascular disease (Giltay *et al*., 2004; Giltay, Zitman, *et al*., 2006).

In addition to imagery vividness, we also considered the characteristics of likelihood and pre-experiencing. The positive future images of more optimistic participants were not only more vivid, but also associated with a sense of greater likelihood of occurring in the near future, and of "pre-experiencing" the imagined event (i.e. the sense of it happening now in the present). This extends the findings of Sharot *et al*. (2007), who found in their fMRI study that more optimistic participants rated imagined positive events as more likely to happen closer in the future than negative events, and experienced these positive events with a greater sense of pre-experiencing. We were able to investigate such relationships within a larger representative sample, and controlling for individual differences in general imagery use.

Additionally, without the constraint of a subtraction condition, as in an fMRI study, we could examine the separate relationships between optimism and the characteristics of positive and negative future imagery on the PIT. We found that the relationship between vividness and optimism was unique to positive imagery. That is, the more vividly someone could imagine a future achievement, for example, the more optimistic they were. For likelihood ratings, both positive and, to a lesser extent, negative imagery independently predicted optimism. That is, optimists showed a greater tendency to endorse, for example, the likelihood of imagined future positive relationships, yet rated imagined future disputes with friends as less likely. Interestingly, once combined in the regression with all other variables, a greater sense of "pre-experiencing" positive events appeared to be associated with lower levels of optimism. This could be interesting to investigate further in future studies as it may be a less useful feature to boost. It could even reflect a psychopathological phenomenon (e.g. in contrast to depression, bipolar disorder is associated with imagery of high "nowness"; Morina *et al*., in press).

Limitations of the study include its correlational nature, which means that issues of causation cannot be explored. Further, fewer than half of those invited to take part in the study elected to take part, and so there could be a self-selecting bias in the study sample. This study represents a critical first step in identifying a modifiable cognitive marker underlying optimism. Current findings suggest that innovative imagery-based interventions to increase optimism should focus on boosting the ability to vividly imagine positive events in the future, e.g. via a computerized, potentially even internet-delivered, intervention (Blackwell & Holmes, 2010), rather than attempting to reduce vividness of negative future imagery (cf. MacLeod & Moore, 2000).

In summary, why is it that some people see the future as bright and full of potential? Current results suggest that when optimists imagine the future they can literally see, in their mind's eye, vivid scenes of positive possibilities. We hope that this research suggests some future developments that will help more people to do the same.

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