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Imagining a brighter future: The effect of positive imagery training on mood, prospective mental imagery and emotional bias in older adults

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ABSTRACT

Positive affect and optimism play an important role in healthy ageing and are associated with improved physical and cognitive health outcomes. This study investigated whether it is possible to boost positive affect and associated positive biases in this age group using cognitive training. The effect of computerised imagery-based cognitive bias modification on positive affect, vividness of positive prospective imagery and interpretation biases in older adults was measured. 77 older adults received 4 weeks (12 sessions) of imagery cognitive bias modification or a control condition. They were assessed at baseline, post-training and at a one-month follow-up. Both groups reported decreased negative affect and trait anxiety, and increased optimism across the three assessments. Imagery cognitive bias modification significantly increased the vividness of positive prospective imagery post-training, compared with the control training. Contrary to our hypothesis, there was no difference between the training groups in negative interpretation bias. This is a useful demonstration that it is possible to successfully engage older adults in computer-based cognitive training and to enhance the vividness of positive imagery about the future in this group. Future studies are needed to assess the longer-term consequences of such training and the impact on affect and wellbeing in more vulnerable groups.

1. Introduction

Older adulthood is associated with lower levels of negative affect (Charles and Carstensen, 2010) and lower rates of depression (Blazer, 2003). Consistent with this, there is a well documented age-related "positivity effect", whereby older adults show an increased preference for positive over negative information in attention and memory (Reed et al., 2014). The importance of such positive affect for physical and cognitive health outcomes in older adults is increasingly apparent.

Higher levels of positive affect are associated with better concurrent and future health prospects, including reduced mortality (Chida and Steptoe, 2008; Lyyra et al., 2006) and reduced risk of coronary heart disease (Kubzansky and Thurston, 2007) and stroke (Ostir et al., 2001). These effects may be particularly relevant to older adulthood, a time when the accumulation of risk factors coupled with the ageing process contributes to a high incidence of chronic disease (Steptoe and Wardle, 2005). Importantly, the association between positive affect and health outcomes appears to be independent of factors such as smoking, body mass or socioeconomic status (Steptoe and Wardle, 2005). Indeed there is evidence of a direct effect of positive affective state on health-related biology, such as lower salivary cortisol, improved cardiovascular function (including blood pressure and heart rate) and immune system function (Dockray and Steptoe, 2010), which strengthens the argument that positive affect may be directly relevant to resilience to physical illness.

Positive affect has also been associated with improved cognitive function (Isen, 2008). There is evidence that positive mood improves performance across a range of cognitive tasks, including working memory (Yang et al., 2013) and rule described category learning (Nadler et al., 2010). In older populations, positive social networks have been shown to be protective against cognitive decline and dementia (Fratiglioni et al., 2000) and positive emotions experienced during these interactions are thought to be one reason for this (Charles and Carstensen, 2010).

Given this important role of positive affect in physical and cognitive health, it is interesting to consider if there are interventions that might be useful in further boosting positive affect in older adults. One possible approach comes from computer-based

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cognitive training paradigms, referred to as "cognitive bias modification", that are designed to re-train dysfunctional biases in thinking (MacLeod et al., 2009; MacLeod and Mathews, 2012). Over the past decade there has been increasing interest in the therapeutic potential of cognitive bias modification in the prevention or treatment of mood disorders (Woud and Becker, 2014). In particular, a mental imagery-based cognitive bias modification approach has been shown to increase state positive affect in healthy young adult volunteers (Holmes et al., 2008a, 2009, 2006; Nelis et al., 2013) and dysphoric individuals (Pictet et al., 2011). As such, imagery cognitive bias modification may be a useful starting point in developing a cognitive training approach to boost positive affect in older adults.

In imagery cognitive bias modification, individuals are trained to automatically imagine positive resolutions of ambiguous information (Holmes et al., 2006, 2008c). Participants are required repeatedly to form positive images in response to ambiguous scenarios and pictures. This approach draws on evidence that mental imagery has a particularly powerful impact on enhancing positive emotion (Arntz et al., 2005; Holmes and Mathews, 2005, 2010; Holmes et al., 2006; Nelis et al., 2012). Recently, studies in clinically depressed individuals have demonstrated a decrease in negative interpretation bias on the Scrambled Sentences Task (a measure of biases in the interpretation of ambiguous information; Lang et al., 2012; Torkan et al., 2014), symptoms of depression (Lang et al., 2012; Torkan et al., 2014) and anhedonia (in the absence of a between-group effect on symptoms of depression; Blackwell et al., 2015), following imagery cognitive bias modification. Such evidence supports the use of imagery cognitive bias modification as a cognitive training approach that may hold promise as a low-intensity computer-based treatment tool in depression.

While boosting positive affect in older adults may be useful in itself, the practise in generating positive imagery inherent in imagery cognitive bias modification may also provide an additional route to benefits in this population. There appears to be a link between particular aspects of mental imagery and optimism, the tendency to have generalised positive expectancies about the future. Specifically, higher levels of optimism are associated with the ability to imagine positive future events more vividly (Blackwell et al., 2013). One possibility is that the ability to vividly imagine positive events in the future may lead to increased optimism. Simulation of possible future events, for example via mental imagery, is an important aspect of future-oriented thinking (e.g. Schacter et al., 2007), and the accessibility and clarity of such simulations may have an impact on how likely someone feels the events are to happen (Sharot et al., 2007; Szpunar and Schacter, 2013). Therefore, if, when someone simulates future events, they experience vivid mental images of positive possibilities, they may have more positive expectancies about the future, i.e. be more optimistic. Optimism is associated with a range of positive health outcomes in older adult populations, including reduced risk of future cardiovascular disease (Giltay et al., 2006) and even reduced rate of death (Giltay et al., 2004). If repeated practise in generating positive imagery during imagery cognitive bias modification could increase optimism in older adults via increased positive imagery vividness, this could confer benefits. However, it is currently not clear whether engaging in imagery cognitive bias modification can, in fact, lead to increased positive future imagery vividness, and whether such an increase in vividness would have a downstream effect on optimism.

The aim of this study was to investigate whether imagery cognitive bias modification is effective in boosting positive affect in a general population sample of older adults. To investigate this, older adults were randomised to receive 4 weeks of computerised imagery cognitive bias modification or a control training condition. They were assessed at baseline, at the end of training (week 4) and at a one-month follow-up (week 8). Consistent with previous studies in younger populations, it was hypothesised that imagery cognitive bias modification would increase positive affect (as measured by the Positive and Negative Affect Scale, PANAS; Watson et al., 1988). It was also hypothesised that imagery cognitive bias modification would increase the vividness of positive imagery about the future (measured using the Prospective Imagery Task, PIT; Stöber, 2000) and optimism (as measured by the Life Orientation Test-Revised, LOT-R; Scheier et al., 1994). Finally, it was hypothesised that imagery cognitive bias modification would decrease negative interpretation bias (measured using the Scrambled Sentences Test, SST; Wenzlaff and Bates, 1998), and improve scores on questionnaire measures of anxiety and quality of life.

2. Methods

2.1. Participants

A total of 81 healthy older adults (aged 60–80) were recruited from the community via local media and public advertisements. Four participants withdrew before completing the study due to bereavement, poor health, or difficulty travelling to the assessment centre, leaving a final sample of 77 participants. All participants were fluent in English, had normal or corrected-to-normal vision and hearing, and scored ≥ 26 on the Mini-Mental State Examination (Folstein et al., 1975). Participants had no current psychiatric disorder (with the exception of two participants who met criteria for specific phobia) or neurological diagnosis, and were taking no psychoactive medications. Participants were randomly assigned to either the "positive imagery" or "control" training condition (see Positive Imagery Training below). All participants provided written informed consent before taking part, and the study was approved by Oxford Central University Research Ethics Committee. Participants were paid £10 per hour for their time (up to £200) and travel expenses were reimbursed.

2.2. Procedure

Following a preliminary telephone screening, participants were invited for a face-to-face screening interview, in which they provided a brief medical history and completed the Structured Clinical Interview for DSM-IV (First et al., 1997), the Mini-Mental State Exam (MMSE; Folstein et al., 1975) and the Beck Depression Inventory – Second Edition (BDI–II; Beck et al., 1996). Eligible participants then completed a baseline assessment (see Section 2.3 below). Following the baseline assessment, participants were randomly allocated to one of two training conditions. Randomisation of participants to a training group was performed by the study Chief Investigator (SEM), who otherwise had no contact with the participants. Randomisation was stratified by scores on the BDI–II to ensure mood was balanced between training groups. Participants then began the training programme, which consisted of an introductory session, followed by 12 sessions over four weeks (see Positive Imagery Training below). Participants completed the training sessions in a quiet room in the Department of Psychiatry, University of Oxford in groups of between one and eight participants (typically a mixture of those in imagery and control training groups). Each participant sat at an individual desk with a laptop and headphones to complete the training. They were instructed not to talk to the other participants during the training sessions and not to discuss the content of the training with other participants for the duration of the study. On completion of the training, participants repeated the assessment ('Post-training Assessment') and had a Magnetic Resonance Imaging (MRI) and