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Positive illusions and its association with cardiovascular functions

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ABSTRACT

The relationship between positive illusions (or self-enhancement) and cardiovascular functions was investigated using Asian samples in two studies. In phase 1 of Study 1, a generalized self-enhancement index was created for 241 participants using a paired word association memory task, a facial emotion recognition task, and a reading test. 122 participants subsequently volunteered for a second phase in this study where their ambulatory cardiovascular functions were measured throughout a single waking day. In Study 2, a priming procedure experimentally induced self-enhancement ($n=35$) and self-effacement ($n=37$) and the participants' cardiovascular arousal and perceived control for a mental arithmetic task were measured. Self-enhancement predicted lower cardiovascular functions for both studies. In Study 1, self-enhancement assessed at phase 2 was a significant predictor while self-enhancement measured at phase 1 was not. In Study 2, the relationship between self-enhancement and vascular reactivity was partially mediated by perceived control. The findings indicate that the relationship between self-enhancement and cardiovascular stress response, which has implications for cardiovascular health, (i) is relevant for Asian populations, (ii) is not just correlational but potentially causal, and (iii) is partly mediated by an increase in perceived control for vascular reactivity.

1. Introduction

Taylor and Brown's (Taylor and Brown, 1988) seminal paper on positive illusions has stimulated much research. In this paper, we regard positive illusions as synonymous with self-enhancement, where both refer to one's tendency to have a positive bias towards evaluating one's abilities or future outcome. For example, a person who regards his or her mathematical ability as better than actual ability is said to engage in self-enhancement or has a positive illusion of superior mathematical ability. In this paper, we sought to examine the relationship between positive illusions and cardiovascular functions, which might have implications for cardiovascular health (Chida and Steptoe, 2010), using Asian samples via correlational and experimental research designs.

Taylor and Armor proposed that positive illusions might be a means to cope with stressful situations and adversity (Taylor and Armor, 1996). Bandura has argued that a positive evaluative bias of one's abilities serves as a form of motivation in striving for improvement whereas veridical self appraisal might be self-limiting (Bandura, 1997). Congruent with this, positive illusions have been found to predict better health. For instance, patients with chronic or life-threatening illnesses, such as AIDS, who have positive illusions, survive longer than those who do not (Reed et al., 1994). Individuals with positive illusions are also less likely to have symptoms of negative affect (e.g., depression; Gaertner et al., 2008).

If positive illusions buffer the negative impact of stress then they should also result in lower autonomic stress arousal. The evidence for this is limited. Taylor and her collaborators (Taylor et al., 2003) were one of the few researchers that reported evidence for this — positive illusions predicted lower cardiovascular and cortisol arousal during acute psychological stress. The current research on the relationship between positive illusions and cardiovascular reactivity has a few limitations. Firstly, most studies have sampled participants from primarily Western cultures (Heine and Hamamura, 2007). Some researchers have suggested that positive illusions might be congruent in societies with social norms that differentiate oneself as distinct from others while in societies that promote integration and conformity (e.g., Asian populations), positive illusions are less prevalent and hence, reasoned to be less relevant in predicting health outcomes within Asian populations (Heine et al., 1999). Secondly, to the best of our knowledge and with the exception of Taylor et al.'s study (2003), most of these studies tend to focus on subjective well-being or perceived health (e.g., Gaertner et al., 2008) rather than examine physical health reactivity. Hence, the benefits of positive illusions on acute cardiovascular reactivity remain tenuous. And lastly, the current research findings on the cardiovascular benefits of self-enhancement are largely correlational and it is not known if the relationship between positive illusions and physiological responses to acute stress could be causal. Our current paper attempts to address these shortcomings.

The mechanisms by which positive illusions influence cardiovascular arousal during acute psychological stress remain unclear.

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Several mediators have been proposed and examined by Taylor et al. (2003). They have suggested that positive illusions might increase psychosocial coping resources which buffer autonomic stress arousal. One way in which coping resources might be enhanced is via increased perceptions of control. For instance, higher self-efficacy for physical activity, a form of perceived control, has been found to nullify the effects of depression and emotional eating on body fat gain (Konttinen et al., 2010). However, Taylor and her co-investigators (Taylor et al., 2003) did not find any significant psychosocial mediators for blood pressure stress arousal. This could be due to the non-specificity of psychosocial mediators and the use of blood pressure as the outcome variable by these researchers. Firstly, they factor analyzed eight different scales measuring constructs such as self-esteem, personality, coping, happiness, and social support to form a composite measure via factor analysis. Hence, it is unclear as to the unique contribution of each mediator. It is possible that only some and not all mediators included in their factor analysis derived psychosocial coping resources variable were relevant. The inclusion of non-significant variables in their factor analysis diluted the specificity of their psychosocial resources measure and might have lowered the statistical power to detect a significant mediation. Secondly, in addition to the non-specificity in mediator selection, blood pressure reactivity, as used by Taylor et al. (2003), might not reveal effects that can be discriminated by the mediators. In this paper, we examine perceived control as a mediator, which has been found to be associated with different patterns of hemodynamic cardiovascular arousal involving cardiac output and total peripheral resistance (Sherwood et al., 1990). Blood pressure stress arousal has been found to be inconsistently related to task controllability when compared to its hemodynamic processes — cardiac output and total peripheral resistance (Why and Johnston, 2008). Control (both perceived and actual) has been found to affect cardiovascular reactivity (Why and Foo, 2010) and is also associated with increased cardiac output and decreased total peripheral resistance reactivity (Sherwood et al., 1990). We hypothesize that perceived control, a psychosocial coping resource, might mediate between positive illusions and cardiovascular hemodynamic arousal (i.e., cardiac output and total peripheral resistance) rather than blood pressure.

This present paper includes a study that examines the utility of positive illusions in predicting ambulatory cardiovascular functions (Study 1); ambulatory cardiovascular assessment is a better index of cardiovascular health than laboratory based measures and also represents cardiovascular functioning occurring in a naturalistic setting vis-à-vis a setting confined within a clinic or laboratory (Pickering et al., 2006). The second study uses a priming technique that experimentally induces positive illusions through self-enhancement/self-effacement in order to determine the potential causal effects of positive illusions (self-enhancement) on acute cardiovascular stress arousal in the experimental laboratory and also tests whether perceived control is a mediator. Both studies investigate the extent the cardiovascular benefits of positive illusions can be generalized to samples taken from a predominantly Asian population.

2. Study 1

Study 1 consists of two phases — in the first phase, participants self-evaluated their abilities in reading, memory and facial emotion recognition and performed tasks that assessed these abilities. These were used to derive a generalized measure of positive illusions. A subset of these participants subsequently volunteered for phase 2 of this study. In phase 2, participants provided their general evaluation of the tasks performed in phase 1 and had their ambulatory cardiovascular functions measured for a single day. These participants also wore a pedometer which was used to index physical activity as a covariate.

2.1. Method

2.1.1. Participants

A total of 241 undergraduates (121 women) participated in phase 1 and a subset of these participants ($n = 122$; 54.9% women) volunteered for phase 2 of the present study in exchange for course credits. Mean (*SD*) age of the participants was 20.9 (1.65) years and participants were all born and raised in East Asian or Southeast Asian cultures (i.e., China, Japan, Philippines, Singapore, Vietnam).

2.1.2. Measures of actual ability

Three tasks were used — reading ability was assessed using the Gray Silent Reading Tests (GSRT; Wiederholt and Blalock, 2000), memory was assessed using the paired-associate learning task (Crawford and Allen, 1996), and facial emotion recognition was assessed using the Micro Expression Training tool (METT; Ekman, 2002). This was done to derive a generalized self-enhancement index that is representative of diverse domains that included abilities in verbal comprehension (GSRT), social perception (METT) and memory (paired-associate learning). The GSRT is suitable for group assessment of silent reading comprehension ability and consists of two parallel forms, each containing 13 developmentally sequenced reading passages with multiple-choice comprehension questions. It has demonstrated adequate reliability and validity, and has been designed as a culture, ethnic and gender bias-free test (Wiederholt and Blalock, 2000). Raw scores were matched with age norms to form a silent reading quotient. The paired-associate learning task is a delayed recall test (Crawford and Allen, 1996). Twenty unique word pairs (e.g., "quality–custom") were presented individually in random order, and participants were given 5 s to study each word pair. At test, one word from each pair (e.g., "quality") was presented to cue retrieval of the other (e.g. "custom"), and participants had 10 s to type in the correct partner word. The Micro Expression Training Tool (METT; Ekman, 2002) was developed to train individuals to improve their recognition of microexpressions, which are facial emotions occurring for about 1/25th of a second. The METT comprises 12 Japanese and 12 Caucasian faces which transit rapidly from a neutral to an emotional face, and then back to a neutral face again. The METT was developed from expressions used in the Brief Affect Recognition Task (JACBART), which has demonstrated good validity and reliability (Matsumoto et al., 2000). Participants performed 28 trials (each lasting 5 s) of the METT's pretest phase and attempted to identify as many microexpressions correctly as possible.

2.1.3. Measures of perceived ability

In phase 1, participants ranked their ability levels using a 100-point scale ("1" for best, "100" for worst) in response to three single-item questions: "Compared to all other participants of this study, how would you rank your (reading/memory/facial emotion recognition) ability?" Responses were then reverse scored so that higher values represented better self-evaluations of ability. In phase 2, participants provided retrospective self-evaluations of their overall relative performance on the reading, memory and facial emotion recognition tasks they had performed in phase 1. Ratings were made on a 100-point scale ("1" for best, "100" for worst), and were then reverse scored so that higher values represented better self-evaluations of overall performance.

2.1.4. Measures of ambulatory cardiovascular functions

For phase 2, the BPro was used to assess ambulatory cardiovascular functions. The BPro (Healthstats International, Singapore) is a watch-like device which is worn around the wrist to perform ambulatory blood pressure monitoring using a modified applanatation tonometric method. When calibrated with a sphygmomanometer, the BPro meets modified AAMI and ESH standards for measuring blood pressure accurately (Nair et al., 2007). Calibration of the BPro was done using