



Self-compassion training modulates alpha-amylase, heart rate variability, and subjective responses to social evaluative threat in women



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Summary A growing body of research has revealed that social evaluative stressors trigger biological and psychological responses that in chronic forms have been linked to aging and disease. Recent research suggests that self-compassion may protect the self from typical defensive responses to evaluation. We investigated whether brief training in self-compassion moderated biopsychological responses to the Trier Social Stress Test (TSST) in women. Compared to attention (placebo) and no-training control conditions, brief self-compassion training diminished sympathetic (salivary alpha-amylase), cardiac parasympathetic, and subjective anxiety responses, though not HPA-axis (salivary cortisol) responses to the TSST. Self-compassion training also led to greater self-compassion under threat relative to the control groups. In that social stress pervades modern life, self-compassion represents a promising approach to diminishing its potentially negative psychological and biological effects.

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According to social self-preservation theory (Dickerson et al., 2004), humans are motivated to preserve social value, esteem, and status. Social evaluation by others represents a primary source of threat to the social self. Social evaluation

threats – job or academic performance reviews, negative judgments by peers, social slights – also represent a regular feature of modern life. Social evaluative stress can elicit marked subjective and biological responses (Dickerson and Kemeny, 2004), and in chronic forms, can lead to mental and physical health problems (Dickerson et al., 2009; Miller et al., 2011; Repetti et al., 2002), and speed biological aging (McEwen and Stellar, 1993; Miller et al., 2011). Given such

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implications, psychologists have become interested in interventions to buffer social evaluative stress and promote more adaptive threat responses.

Social evaluation directly threatens self-esteem, and evidence indicates that dispositional self-esteem and related self-resources can ameliorate social evaluative threat responses (e.g., Taylor et al., 2003). Yet self-esteem can have psychosocial costs, including self-defensive anger, inaccurate self-perceptions, narcissism, self-worth contingency, and relationship conflict (Emmons, 1984; Leary et al., 2007; Neff and Vonk, 2009). Costs may also be physical; for example, narcissism has been associated with higher cortisol at rest (Reinhard et al., 2012) and in response to social evaluation (Edelstein et al., 2010) among men. Thus, researchers recently have asked whether other forms of self-perception may offer psychosocial benefits in the face of social threat without such associated costs.

Self-compassion appears to represent one such quality. According to Neff (2003a), self-compassion involves “being open to and moved by one’s own suffering, experiencing feelings of caring and kindness toward oneself, taking an understanding, nonjudgmental attitude toward one’s inadequacies and failures, and recognizing that one’s experience is part of the common human experience” (p. 224). A self-compassionate person sees his or her weaknesses and shortcomings accurately, yet reacts with self-kindness rather than with self-judgment (Leary et al., 2007). Relative to trait self-esteem, self-compassion has predicted more stable feelings of self-worth that depend less on external outcomes such as successful performance or social approval (Neff and Vonk, 2009). Self-compassion appears to facilitate adaptive responding to social stressors without resorting to self-esteem enhancement (including narcissism) or a devaluing of either the threat source (Neff and Vonk, 2009) or the self (Leary et al., 2007). Thus, self-compassion appears to have psychological benefits, including resilience to social threats.

To date, most self-compassion research has been correlational or based on brief experimental inductions. However, researchers have begun to examine the effects of short-term training in Buddhist meditative practices aimed at cultivating compassion for the self and others (Hofmann et al., 2011) on social threat responding. In a pioneering study, Pace et al. (2009) examined the impact of a 6-week training in compassion meditation on subjective, neuroendocrine (cortisol), and immune (IL-6) responses to an acute social evaluative stressor, the Trier Social Stress Test (TSST; Kirschbaum et al., 2008). The compassion and control groups did not differ in subjective, cortisol, or IL-6 responses to the TSST. However, home practice time in the compassion-trained group correlated with lower IL-6 and distress responses. The compassion group undertook relatively intensive training (totaling 11–18 h) in compassion meditation for self and others as well as mindfulness and concentration practices. Thus, the training drew from multiple contemplative practices taught over a 6-week period. Also, the training was not specifically focused on managing social stressors. We asked whether briefer and more focused self-compassion training might more strongly impact stressor responses. Focusing on teaching self-compassion, a single dimension of the training undertaken by the Pace et al. (2009) participants, also clarifies whether

this specific training yields benefits. People preparing for known social stressors, including interviews, performances, or difficult conversations, could more readily undertake such training. We also assessed a different array of psychobiological processes that may track the effects of self-compassion training on acute stress responses.

The present study thus investigated whether brief self-compassion training modulates a range of psychobiological responses to an acute social stressor (using the TSST). Our work builds on the nascent work in this area (Fredrickson et al., 2008; Kok et al., 2013; Pace et al., 2009) in important ways. First, we used a brief (45 min total), self-administered training in self-compassion delivered in brief intervals over 5 days leading up to the stressor. We employed *metta* (loving-kindness) meditation, which involves the simple repetition of statements of kindness toward the self or others, and thus was well-suited to guided self-practice. Second, we assessed a range of stress-relevant psychobiological outcomes, including subjectively experienced anxiety and measures of two major physiological systems activated during acute social stress: the hypothalamic-pituitary-adrenal (HPA) axis and the autonomic nervous system, implicating both neuroendocrine and cardiovascular systems. Third, we included two rigorous control conditions – an attention control/placebo intervention group and a no-intervention group – to enhance our ability to assess the role of self-compassion training relative to both attention and engagement per se. In summary, we tested the value of a low-demand, stressor-focused training against rigorous control conditions to ameliorate a range of psychobiological responses to social evaluative threat.

We hypothesized that brief self-compassion training would reduce acute social evaluative threat responding (in anticipation of and during the TSST) and speed response recovery. Specifically, we predicted that relative to placebo training and no-training control conditions, self-compassion training would dampen biological stress responses to the TSST. We thus examined salivary cortisol responses, reflecting HPA axis activity (see Sapolsky et al., 1986), salivary alpha amylase (sAA), purported to reflect sympathetic nervous system activity (Rohleder et al., 2004; van Stegeren et al., 2006), and respiratory sinus arrhythmia (RSA; or high frequency heart rate variability), a stress-reactive marker of cardiovascular parasympathetic functioning (Thayer and Lane, 2000). In the TSST context, lower sAA responses are interpreted as dampened sympathetic system responding, which has been linked to lower defensiveness (see Bauer et al., 2002). Higher RSA has been linked to flexible attention deployment and adaptive emotion regulation in threat contexts (Thayer et al., 2009, 2012; Thayer and Lane, 2000). All three indices have been shown to be reactive to social evaluative threat (Nater et al., 2006) and all are implicated in physical health (Glaser and Kiecolt-Glaser, 2005; McEwen and Stellar, 1993; Thayer and Sternberg, 2006). We also predicted that relative to the control conditions, self-compassion training would reduce TSST-related anxiety and increase self-compassion, both in the TSST environment and in general. We focused on women in this study given that they report lower self-compassion than men (Neff, 2003a), recommending them to an intervention designed to boost this purported stress resilience factor.

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