

Effect of Compassion Meditation on Neuroendocrine, Innate Immune and Behavioral Responses to Psychosocial Stress

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Meditation practices may impact physiological pathways that are modulated by stress and relevant to disease, and populations whose cultural traditions include regular meditation practice may be more resilient to chronic psychosocial stress challenge. Several recent studies indicate that meditation training may be associated with relatively subtle, and non-specific, changes in immune parameters in patients with cancer (1,2). The published literature does not address an area of great potential importance to the link between stress, immunity and illness, specifically whether meditation might beneficially modulate inflammatory responses to psychosocial stress. Social isolation, naturalistic life stress and brief laboratory psychosocial stressors have all been associated with increases in peripheral inflammatory markers. Conversely, positive social support improves health and longevity and has been associated with reduced inflammatory activity. The vast majority of meditation studies conducted to date have examined practices designed to promote focused attention and/or non-judgmental mindfulness. However, within the wider corpus of meditative techniques are many practices that have as their goal the active generation of compassionate, altruistic cognitions and emotions for other people. Little is currently known regarding health-relevant physiological effects of these types of compassion-based practices. Given that inflammatory pathways may contribute to the link between social support and positive health outcomes, we hypothesized that by enhancing perceived positive social connectivity, compassion meditation might be an especially effective means of reducing inflammatory reactivity to psychosocial stress.

Methods

Participants

61 freshman college students (29 males/32 females) between the ages of 17 and 19 (mean age 18.5 years, SD 0.7) participated in the study. Participants were excluded for active psychiatric treatment (including psychotherapy/counseling) or for a score ≥ 30 on the Inventory of Depressive Symptoms—Self Report (IDS-SR), consistent with moderate to severe depression. Participants were free of psychotropic medications or other medications that might impact physiological responses to the psychosocial stress test. All participants provided written informed consent, and study procedures received *a priori* approval by the Emory IRB.

Overview of Study Procedures

The study occurred during spring and fall academic semesters in 2006. All participants were recruited from PE 101, a semester-long, health education class at Emory. Participants were stratified by sex and then randomly assigned to six weeks of compassion meditation training or to a health discussion group, which served as an active control condition for the study. Between study weeks 7 and 9, all participants participated in a standardized laboratory psychosocial stressor (Trier Social Stress Test [TSST]). TSSTs occurred between 2 and 5 PM. **Compassion Meditation and Health Education Discussion Groups**
The compassion meditation technique employed in this study was designed and taught by one of us (LTN). Students randomized to meditation training attended a 50-minute class twice a week for six weeks. Class sessions combined pedagogy with an average of 20 minutes of meditation practice. Participants were encouraged to practice outside of class an average of 30 minutes a day. Participants were provided with a meditation CD designed to guide “at-home” practice and were asked to complete a secure internet-based meditation diary on a daily basis throughout the study period in which they recorded time spent practicing. Although secular in presentation, the compassion meditation technique employed in this study was derived from Tibetan Buddhist mind-training (Tibetan *lojong*) practices that focus on the generation of altruistic cognitions and emotional states towards all persons, regardless of whether these persons are those for whom the meditator feels affection, indifference or aversion (see Figure 1).

Trier Social Stress Test and Dependent Variables

Participants arrived at the Emory University Hospital General Clinical Research Center 90 minutes prior to the TSST stressor (public speaking followed by mental arithmetic) to allow for placement of and adaptation to an intravenous line. During the TSST, blood (7 ml) was collected from an indwelling venous catheter prior to initiation of the public speaking stressor (T0) and 15, 30, 45, 60, 75 and 90 minutes after stressor initiation into chilled EDTA-coated monovettes and centrifuged immediately. Plasma was stored at -80 C until assayed. Plasma IL-6 concentrations were measured by enzyme-linked immunosorbent assay (ELISA) (R&D Systems, Minneapolis, MN). Plasma cortisol concentrations were determined by radioimmunoassay (Diasorin, Stillwater, MN). The 30-item Profile of Mood States (POMS) was used to evaluate general distress levels prior to, and immediately following, the TSST stressor. Following standard procedure, general distress was calculated by summing scores on the tension-anxiety, depression-dejection, anger-hostility, fatigue-inertia, and confusion-bewilderment subscales and subtracting scores on the vigor-activity subscale.

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Week 1: Developing basic concentration and mental stability. Participants are taught basic attentional meditation practice (i.e. shamatha) by using the breath as the object of focus.

Week 2: Introduction of mindfulness practice (i.e. vipassana). Participants are instructed in the techniques of non-judgmental observation of the processes of thought and bodily sensation.

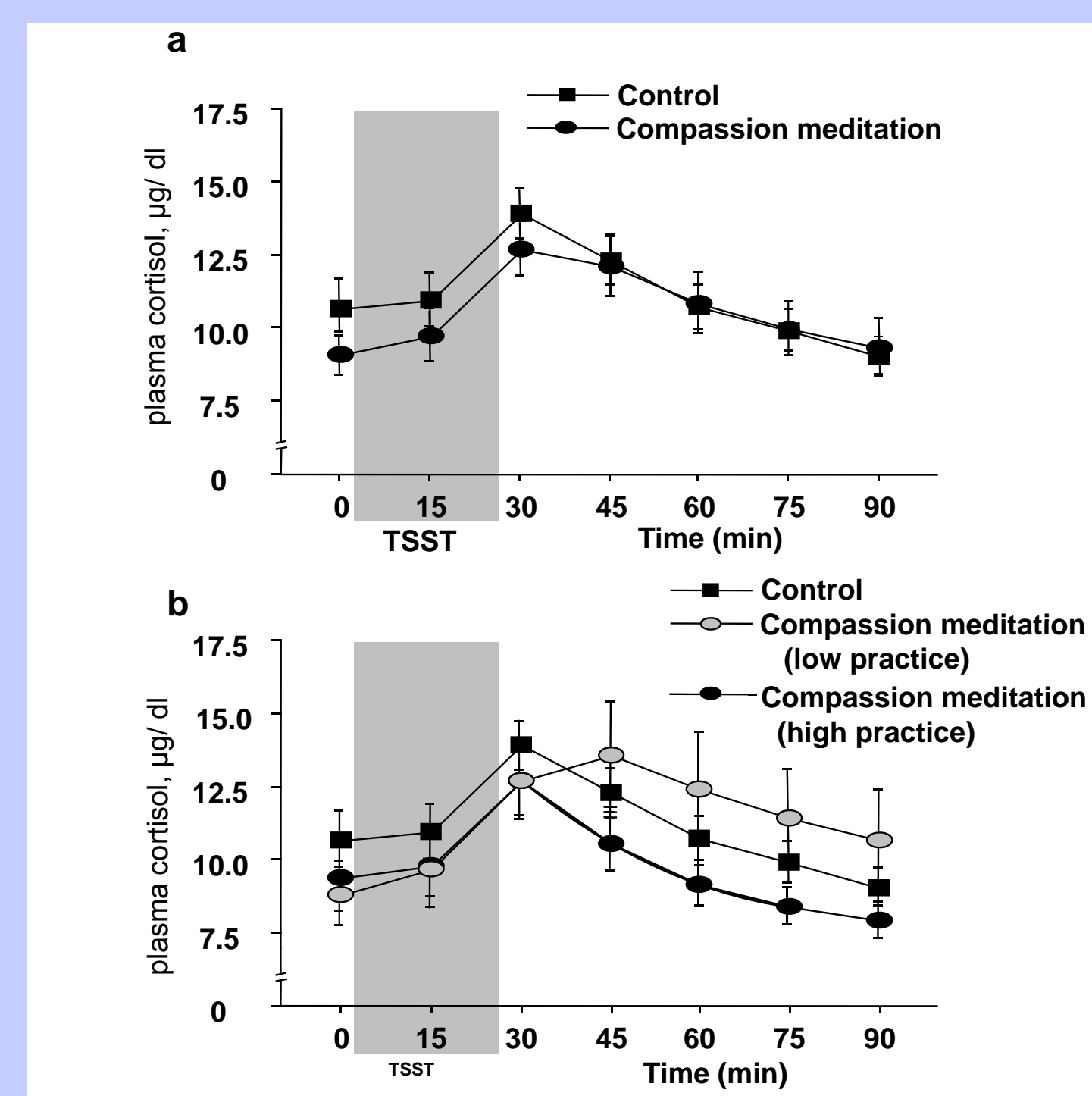
Week 3: Concentrative and mindfulness techniques are used to explore universal human desires for happiness and wishes to avoid suffering as a prelude toward the practice of developing compassion for the self.

Week 4: Meditation is continued on the thought that the self shares with all people a desire for happiness and a wish to avoid suffering, as well as the struggle to attain these goals. Participants are instructed to expand upon this awareness to examine the contingent and changeable nature of the distinctions between “friends” and “enemies”, with the goal of generating a felt sense that instinctive emotional responses to others do not reflect reality.

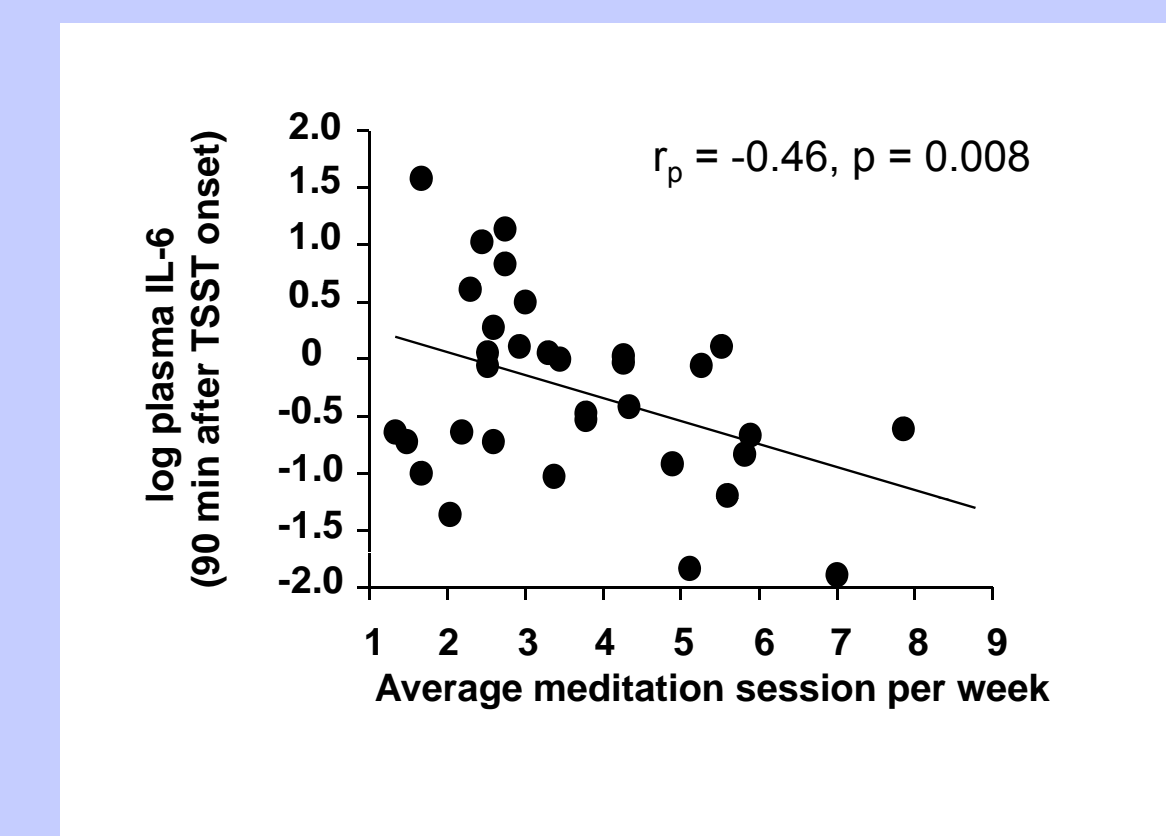
Week 5: Meditative reflection is conducted on the disadvantages of selfishness and a self-centered attitude and the advantages of considering the welfare of others. Participants are guided through meditative techniques aimed at generating compassionate emotions and cognitions for those emotionally close to them.

Week 6: Meditation aimed at attempting to generate compassionate emotions not only for friends, but also for strangers and people participants do not like is practiced. Instructions are given for how to continue this practice “at home” following the completion of the class.

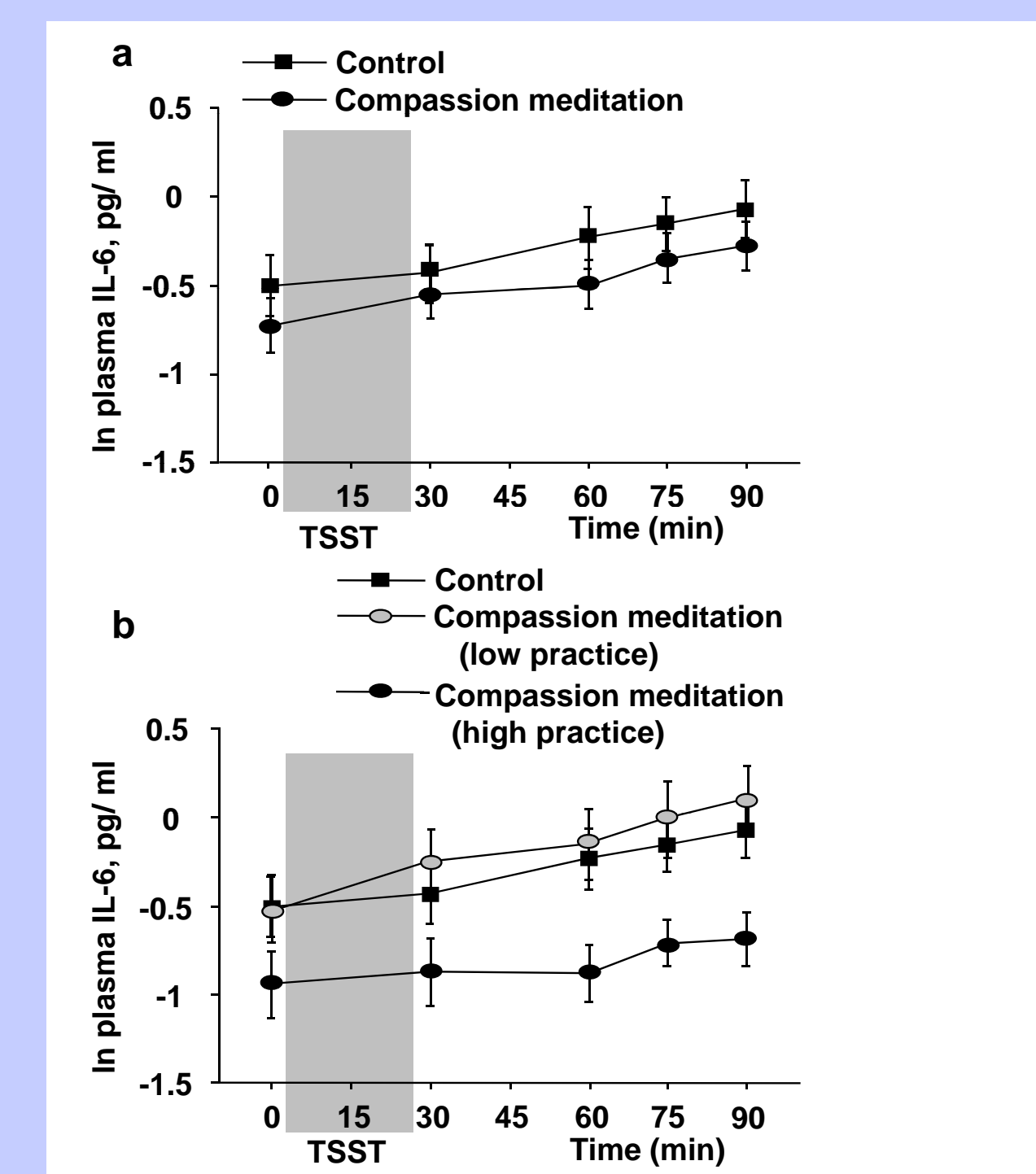
1. Compassion meditation training does not alter psychosocial stress-induced plasma cortisol levels.



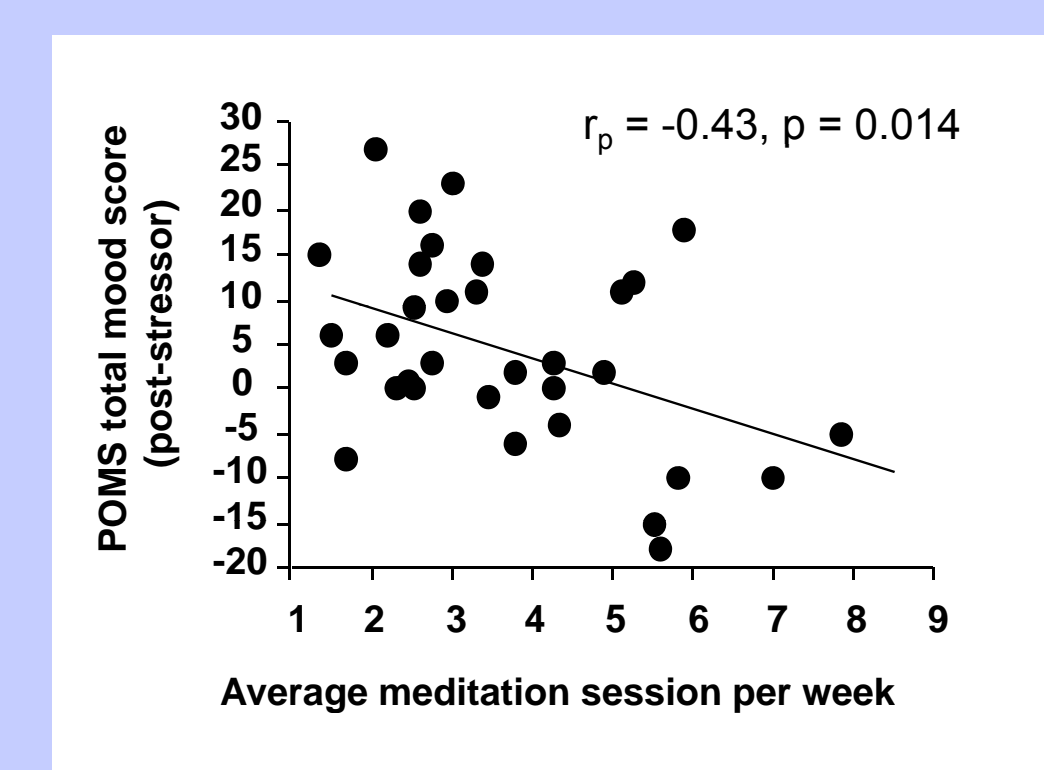
2. The interleukin-6 response to psychosocial stress challenge is inversely correlated with number of compassion meditation practice sessions per week.



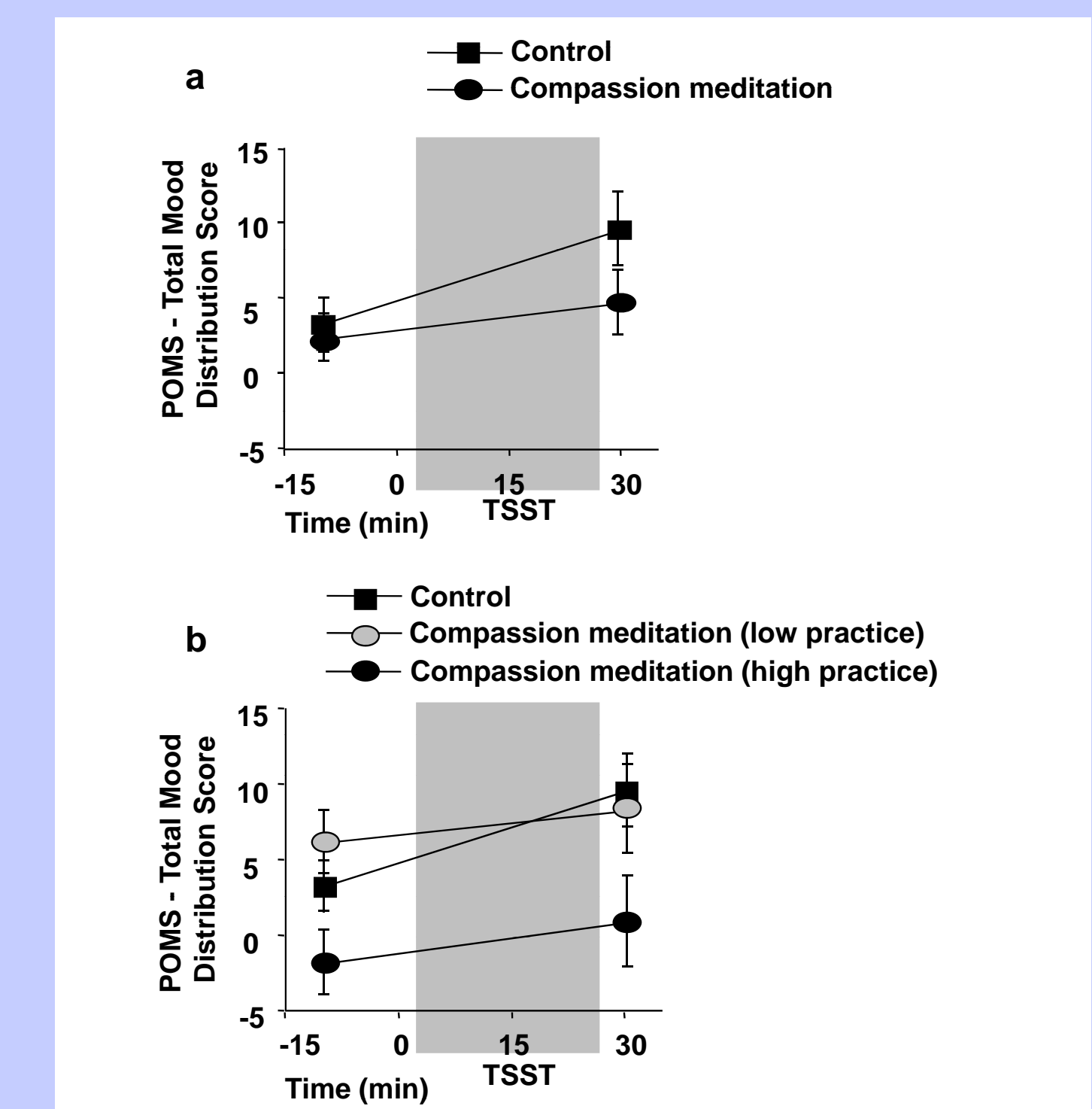
3. Compassion meditation reduces stress-induced plasma interleukin-6 in participants who practice the technique.



4. Distress after psychosocial stress challenge is inversely correlated with compassion meditation practice sessions per week.



5. Baseline distress and psychosocial stress induced distress are influenced by compassion mediation as a function of practice time.



Results and Conclusions

1. Randomization to compassion meditation was not associated with altered plasma cortisol responses to stressor challenge.
2. While no differences were found between the meditation group as a whole and controls in plasma IL-6 responses to the TSST, students in the high practice time meditation group demonstrated less of an increase in IL-6 than did students in either the control or low practice time groups.
3. In the entire group of meditators, time spent practicing was inversely correlated with post-stressor IL-6 plasma concentrations.
4. High practice time meditators also endorsed less distress during the TSST, and practice time in the entire group of meditators was inversely correlated with distress.
5. Results from the current study suggest that practicing a meditation procedure designed to enhance positive cognitive and emotional appraisals of social connectivity may reduce inflammatory activity as well as subjective distress.

References

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